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# WOOD®

THE WORLD'S LEADING WOODWORK GAZINE

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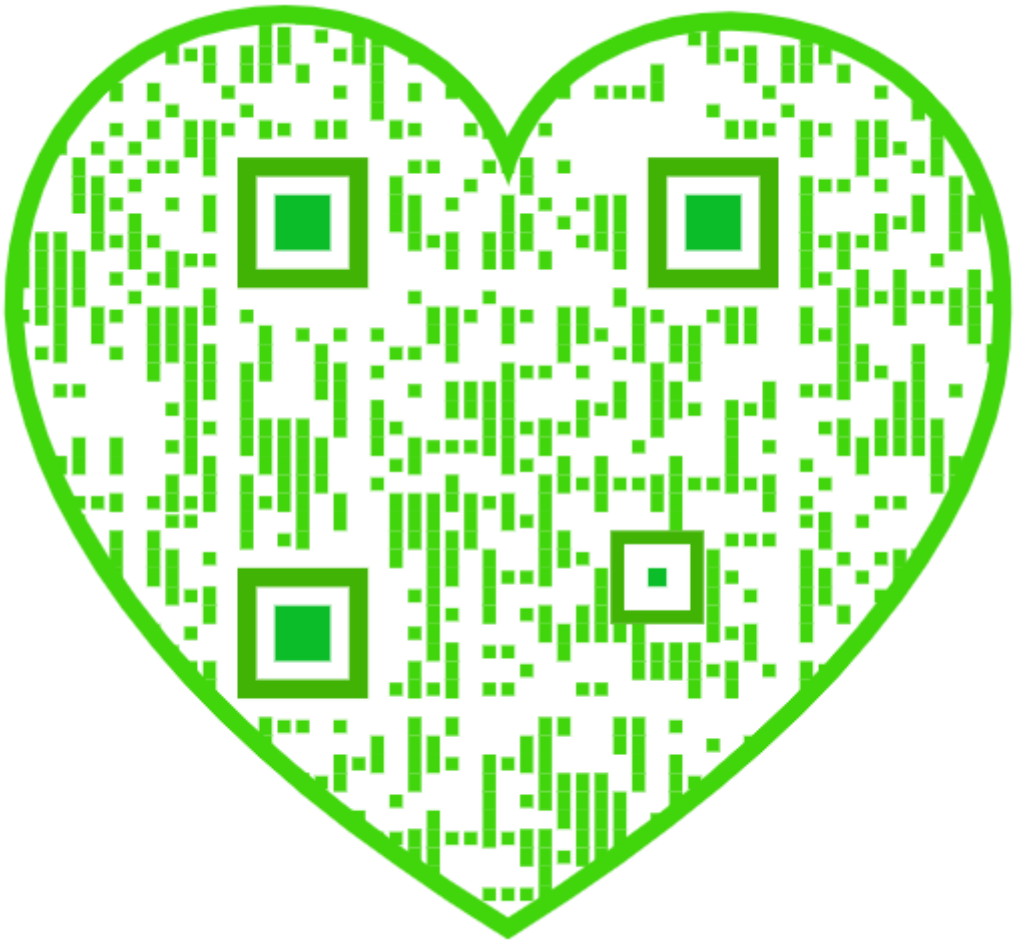

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THE WORLD'S LEADING WOODWORKING MAGAZINE

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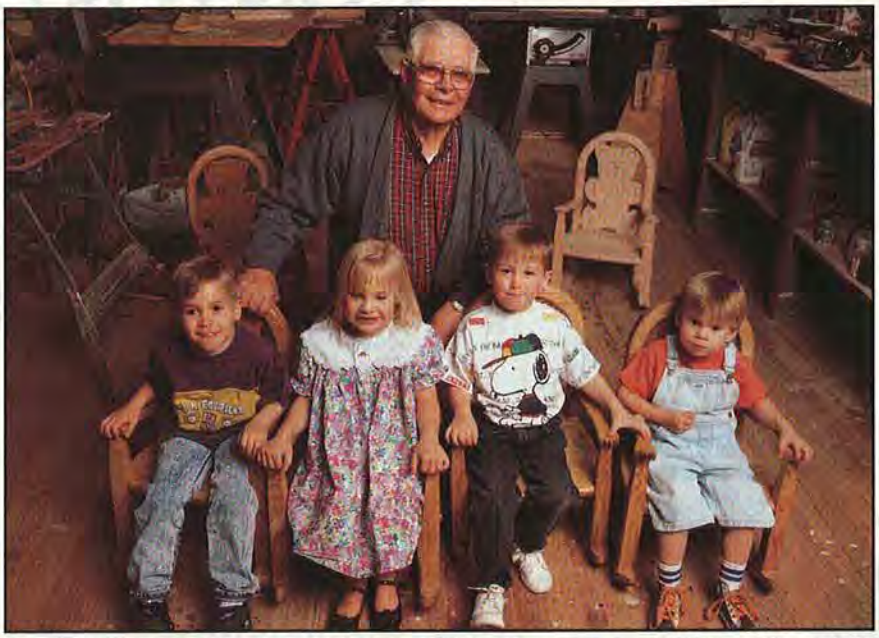
# THE EDITOR'S ANGLE

## HOW ELMER WERNER BECAME THE WORLD'S MOST-POPULAR GREAT-GRANDPA



**Elmer Werner in his shop with four of his six great-grandchildren (from left) Tucker Zeleny and Kelsey, Brady, and Nathan Werner.**

It all started mid-October last year when Elmer Werner, a 75-year-old retiree from Carleton, Nebraska, pulled the December '93 issue of *WOOD®* magazine out of his mailbox. He'd been looking for a project to build for his six great-grandchildren for Christmas. And when he saw the Teddy Bear Rocker on the cover, he knew he'd found the perfect gift.

So Elmer, who took up woodworking about 15 years ago when he retired, went to the shop and started building. It took him a fair amount of time to construct all six rockers, but they were ready in plenty of time for Christmas Eve.

Every year on December 24th—just like clockwork—the Werner children, grandchildren, and great-grandchildren gather at the folks' place to celebrate. (Marjorie Werner, Elmer's wife of 52 years, passed away this past summer.) They go to church first, then eat a light snack and open their gifts.

Elmer's great-grandchildren (four of them are shown with him *above*) may not be very old, but they know their great-grandpa pretty well. He makes them something special every year.

Like all children, Elmer's great-grandkids have a hard time waiting to receive their presents on Christmas Eve. In fact, this past year, Nathan, the good-looking guy at right in the photo, took things into his own hands. While the rest of the family members were eating, he wandered off in search of great-grandpa's presents. Sure enough, when Nathan's mom found him, he was sitting in the bedroom in one of the rockers having a grand old time.

Hey Elmer, I think the kids are on to you. Maybe in a couple of years you will have some helping hands out in your shop. Now that would be great.

Happy Holidays everybody, and have a terrific New Year!

Larry Clayton



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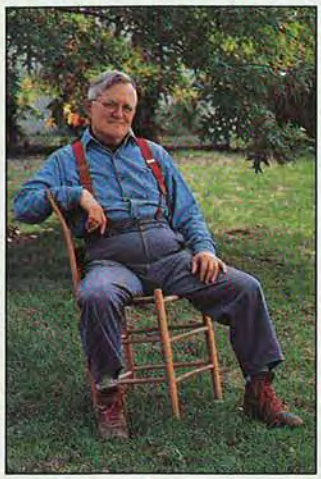

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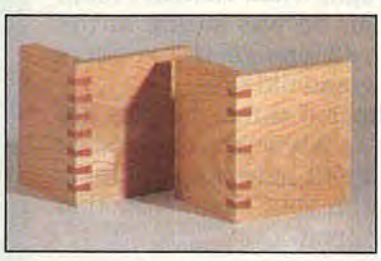

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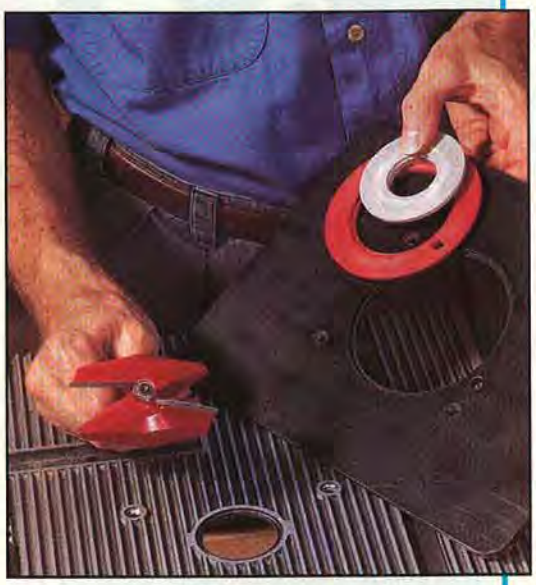
# SIMPLE SETUPS FOR RAISED-PANEL ROUTER BITS



When your router bit doesn't fit in a metal table, you can run it above the tabletop. In a wooden table, use a router-table plate with inserts like those held *above* at right.

Raised-panel router bits help you create raised panels for cabinet and passage doors. But the size of these bits—up to 3½" in diameter—makes them dangerous in a hand-held router. For safety, you should put raised-panel bits in a variable-speed router mounted to a router table.

But there is one hitch. Most router-table openings measure under 2" in diameter. What do you do when your bit is bigger than the opening in your table? Here, we offer two solutions.

## Metal router tables: Make your cuts above

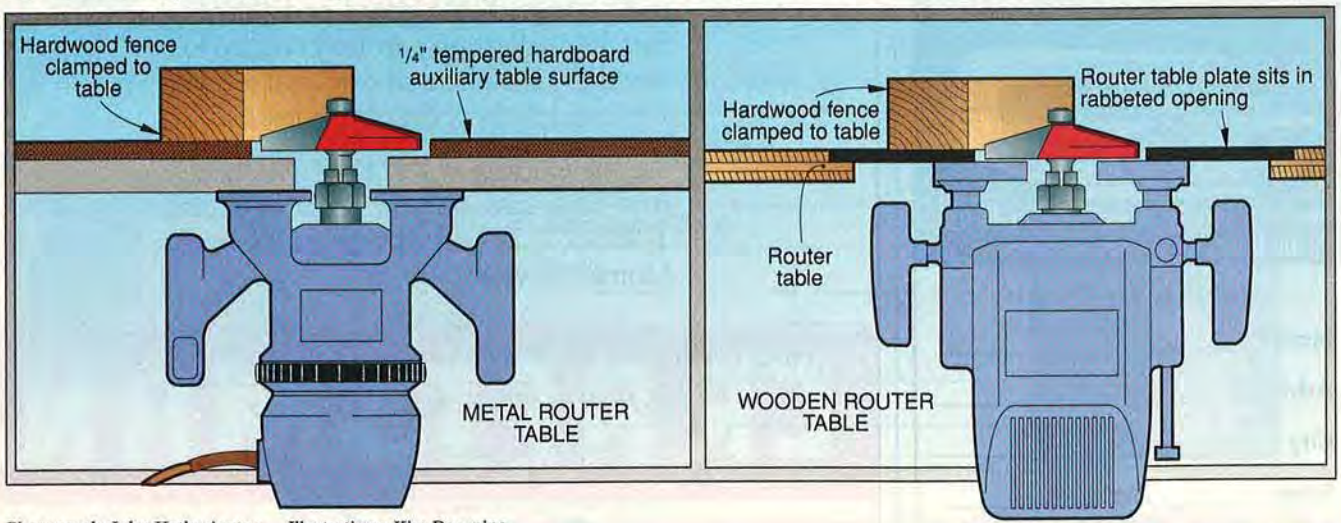
On a metal router table, you may be able to operate a raised-panel bit above the surface of the table. Drop the bit in from the top and lower it until the bottom of the cutter is 1/16-⅛" above the top of the table. The one qualifier is that no more than ½" of the shank should be exposed above the collet. Raising the bit too far out of the collet may cause a big bit to vibrate excessively, or bend the collet and lead to a dangerous accident.

To prevent your workpiece from sliding under the bit, make a ¼"-thick tempered hardboard auxiliary surface for the top of your table. Bore a hole in the auxiliary surface about ¼" larger than the diameter of your bit, and center the hole over the bit as shown in the drawing *below left.* Clamp the auxiliary surface to the router table, and add a fence as shown.

## Wooden router tables: Best for plunge routers

With many plunge routers you can't raise the collet high enough to position a raised-panel bit above the table safely. If that's the case with your router, you'll need to use a plywood or particleboard router table with a plastic laminate surface and a router-table plate that sits in a rabbeted opening in the top. These plates allow you to set the bottom of the cutters below the surface of the table, as shown in the drawing *below right.*

Some plates have doughnut-shaped inserts that pop in and out to more closely match the diameters of various bits. The plate shown in the photo comes from Rousseau Co., 1712 13th St., Clarkston, WA 99403; call 800/635-3416. You also can buy inserts and router accessories from Woodhaven, 5323 W. Kimberly, Davenport, IA 52806; call 800/344-6657.


Hardwood fence clamped to table
1/4" tempered hardboard auxiliary table surface
METAL ROUTER TABLE
Hardwood fence clamped to table
Router table plate sits in rabbeted opening
Router table
WOODEN ROUTER TABLE

Photograph: John Hetherington Illustrations: Kim Downing



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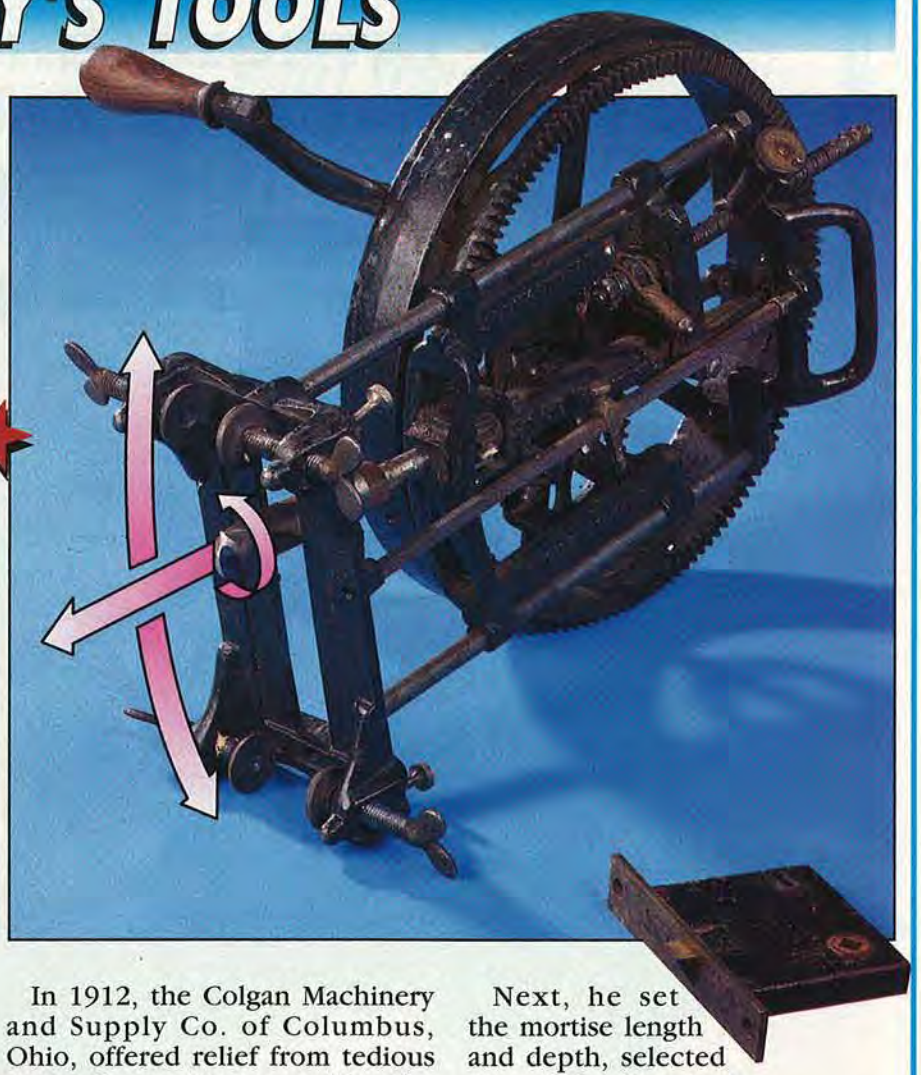
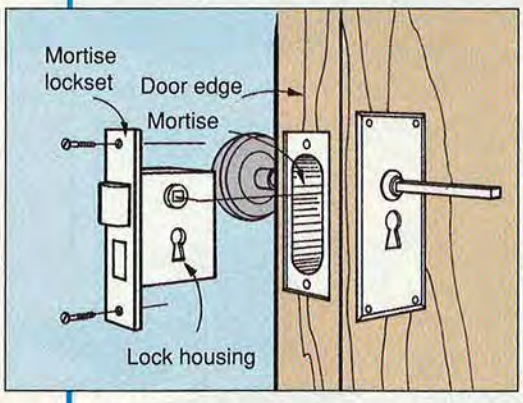
# THE DOOR-MORTISING CHAMPION

## Latching onto one of these made lock installation faster



By boring just two holes, you can install a modern tubular lockset in a new door. The entire job usually takes only a few minutes. Back around the turn of the century though, carpenters invested considerably more time and effort in preparing a door for a lock. That's because the locksets in vogue then fit into mortises cut into the solid-wood door edges, as shown in the illustration *below.*

The most demanding of the many steps involved in installing one of those mortise locks was cutting the deep mortise for the lock housing. After boring a series




of overlapping holes into the edge of the door, the carpenter chiseled out the waste, taking pains to keep the recess centered on the door edge and parallel to the sides. This accounted for many hours' work in an average house.

In 1912, the Colgan Machinery and Supply Co. of Columbus, Ohio, offered relief from tedious manual mortising with the Champion Mortiser, shown *above.* It looked daunting with its gears, worm screw, trip levers, brass knobs, ratchets, and rods. But it proved relatively easy to use. Indeed, the original instructions cover set-up and operation in only six steps.

The large bit visible at the left side of the machine cuts the mortise. Though it resembles a twist drill, you'll understand the machine easily if you think of it as a router bit.

To mortise a door for a lock, the carpenter clamped the Champion to the door, which was already hung. Then he centered the machine's index marks on the door edge, tightened the clamp screws, and wedged a board between the machine and the floor for support.

Next, he set the mortise length and depth, selected one of the three cutting speeds, and tightened the bit (the instructions warn repeatedly to do this). Then, turning the crank, the carpenter became the conductor of a symphony of mechanical effects.

The bit not only rotated, it swung up and down in an arc to form a slot. And after each vertical cycle, it advanced a little farther into the wood. The rate at which all this happened depended on the speed setting. At any speed, a chorus of clicks and whirs accompanied the action. Until factory-mortised doors became available in the 1930s, the Champion Mortiser helped build many homes a little bit faster.

Tool from the collection of Leo F. Rockenstein, O'Fallon, Missouri
Photograph: John Hetherington
Illustration: Mike Henry
Written by Larry Johnston



Print this article

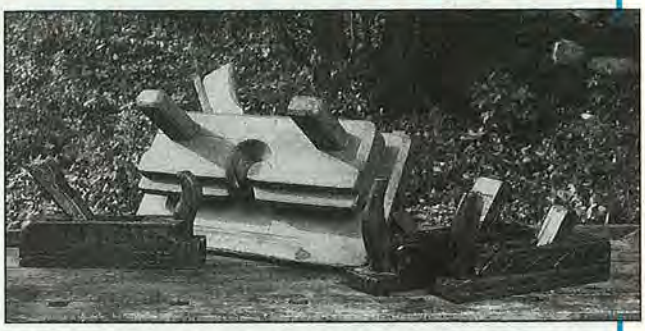
# THE EARLY AMERICAN INDUSTRIES ASSOCIATION

**Woodworkers are a vast fraternity, willing to share knowledge, skills, and experience. And many of the craft's specialties are channeled into associations where members focus their common interests.**

Old tools often fascinate woodworkers as much as new ones.
"Who owned it?"
"What does it, or did it, do?"
"When and where was it made?"

Questions like these form the mystique shrouding the tools, obsolete trades, and industries of long ago that have been the focus of the Early American Industries Association (EAIA) for over 60 years.

More than 3,000 members from 50 states and 12 countries join under the EAIA charter "to encourage the study and better understanding of early American industries in the home, in the shop, on the farm, and on the sea; also, to discover, identify, classify, preserve, and exhibit obsolete tools, implements, and mechanical devices which were used in early America."



**Antique woodworking tools, like these planes from the collection of member Vern Ward, reflect only one aspect of the Early American Industries Association's broad interests.**

Membership in EAIA is open to any individual or institution sharing this interest and purpose, and includes collectors, curators, conservators, researchers, writers, teachers, and institutions such as libraries, museums, and restoration groups.

You'd expect such a diverse group to have varied interests. Try picking an area to explore from these identifiable EAIA specialties: farm implements and dairy equipment; woodworking, metalworking, and leatherworking tools; textile machines; lighting devices; domestic utensils; hunting, fishing, trapping, or nautical equipment; medical and dental equipment; scientific instruments; weighing and measuring devices; industrial equipment; and vehicles. Whew!

At EAIA annual meetings, held each spring, members have the chance to exhibit and view collections, add to them at tool sales and exchanges, and learn of bygone techniques and domestic industries through demonstrations, exhibits, and interestingly focused seminars.

Researching the old ways, and sharing that research through publications, has been a primary activity of the EAIA. In *The Chronicle*, the association's quarterly magazine, members describe past technology, current collecting, preservation techniques, and other related subjects. *Shavings*, the bimonthly newsletter, reports on meetings and activities.

Films and books for research and study are available through the EAIA library located in the Spruance Library of the Mercer Museum in Doylestown, Pennsylvania. Discounts on books published by the association, affiliated organizations, and trade and university presses, are available.

Organizations with ties to the EAIA include EAIA West, Mid-West Tool Collectors Association, South West Tool Collectors Association, and the Three Rivers Tool Collectors Association.

Individual membership is $25 per calendar year, and includes the publications plus an annual membership directory.

For more information and membership application, write: John S. Watson, Early American Industries Association, P.O. Box 2128, Empire State Plaza Station, Albany, NY 12220.

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# TALKING BACK

**We welcome comments, criticisms, suggestions, and even compliments. Send your correspondence to: Talking Back, *Better Homes and Gardens® WOOD®* Magazine, 1912 Grand Ave., Des Moines, IA 50309-3379.**

## Removing static from the outside

Some time ago, I installed a dust-collection system in my workshop using about 70' of 4" plastic pipe and flexible hose. I used ideas from "Central Dust Collection" in your June 1991 issue, and modified them to fit my circumstances.

However, I did make a major change in the static-electricity-removal system. The internal-ground-wire system, as described in your article, has drawbacks that include difficulty in installing and connecting the wire inside the pipe, and the potential to cause clogs as chips catch on the wire or joints.

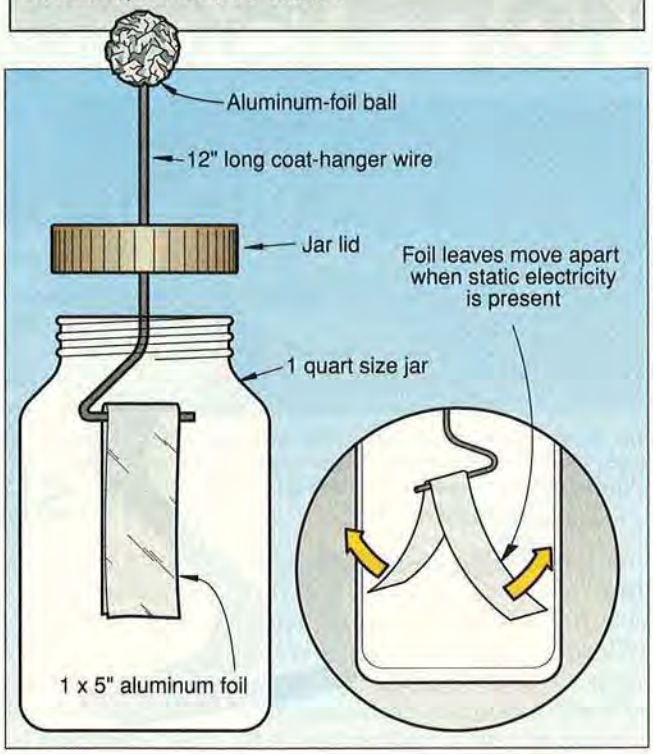
I know that plastic, though it functions as an insulator for generated AC and DC current, does not block static electricity. So, rather than installing the ground wire inside the piping as suggested in your article, I spirally wrapped a piece of insulated wire along pipes and hoses, and grounded the wire at each machine.

*—R.J. King, Boerne, Texas*

*R.J., we have heard from several readers looking for an alternative means of grounding PVC pipe in a dust-collection system. After receiving your letter, we looked further into how to best go about removing static electricity.*

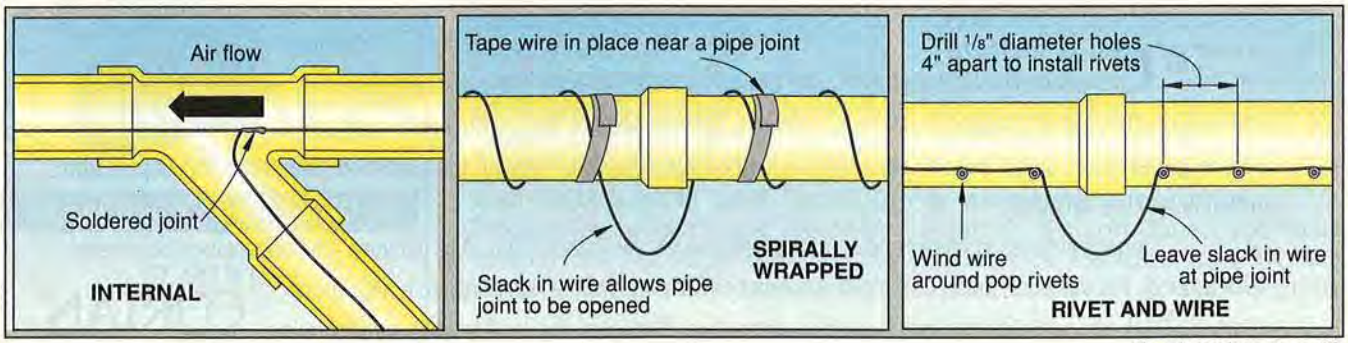
*Our research confirms your statement that static electricity does not obey the same laws as generated current. We also tested your spirally wrapped ground-wire system, as well as another exterior-grounding system composed of pop-rivets fastened into holes drilled in the side of the PVC piping and connected by a bare copper wire. We found that both systems work equally well in removing static electricity, and both offer their own advantages.*

*The spiral-wrap system is easy to install to a new system, but the rivet and wire setup is easier to retro-fit to an existing system, and it also requires less wire than the spiral wrap. We prefer the rivet-and-wire system because of its easier modification, simple and secure installation, and neater appearance. In either case, leave some slack wire at the joints in case you need to disconnect the pipes to dislodge a clog.*


Aluminum-foil ball
12" long coat-hanger wire
Jar lid
Foil leaves move apart when static electricity is present
1 quart size jar
1 x 5" aluminum foil

*We also found a simple device for testing for the presence of static electricity. It consists of a coat-hanger wire with a 90° hook on one end, a jar, the jar lid, and two pieces of aluminum foil, as shown* above. *Slide the wire through a hole in the lid, with the hooked end placed inside the jar. Place a narrow strip of aluminum foil across the hook. Form the second piece of aluminum foil into a ball and install this ball on the straight end of the wire.*

*This device works on the principle that like charges repel each other. Moving the foil ball near a static charge produces an equal charge in both sides of the strip, and the ends of the strip move away from each other. Use this tester to check for the presence of static electricity at several points in your dust-collection system.*


Air flow
Soldered joint
INTERNAL
Tape wire in place near a pipe joint
Slack in wire allows pipe joint to be opened
SPIRALLY WRAPPED
Drill 1/8" diameter holes 4" apart to install rivets
Wind wire around pop rivets
Leave slack in wire at pipe joint
RIVET AND WIRE

*Continued on page 12*

# TALKING BACK

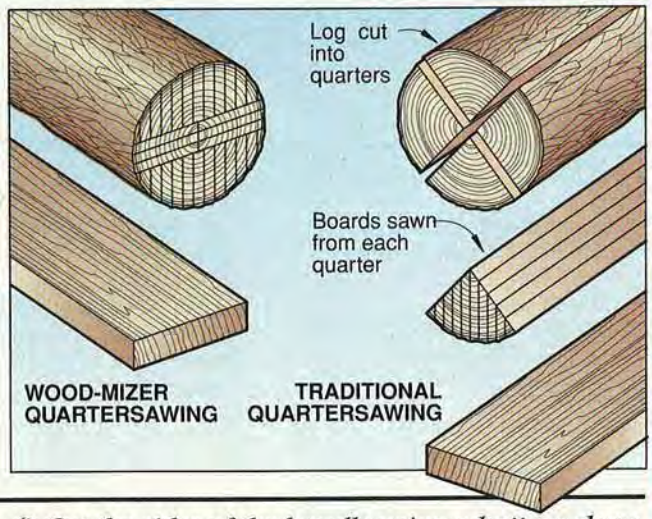
*Continued from page 10*

## A different quartersawing technique

I was under the impression that quartersawn lumber was cut differently than shown in the cutting diagrams published in "The *WOOD*® Gang Goes Logging" in the December 1993 issue.

***—James W. Turney, Bemus Point, N.Y.***

*The diagram you refer to, Jim, illustrates a variation of the quartersawing technique recommended by Wood-Mizer representatives for use with their machine. The more traditional approach to quartersawing involves first cutting the log into quarters and then sawing these quarters into boards (as shown* far right). *Both techniques yield edge-grained lumber, with greater dimensional stability than flatsawn wood.*




## Router-turning six- and eight-sided handles

How can I adapt the router-table turning technique from the April 1994 issue for making six- and eight-sided chisel handles?

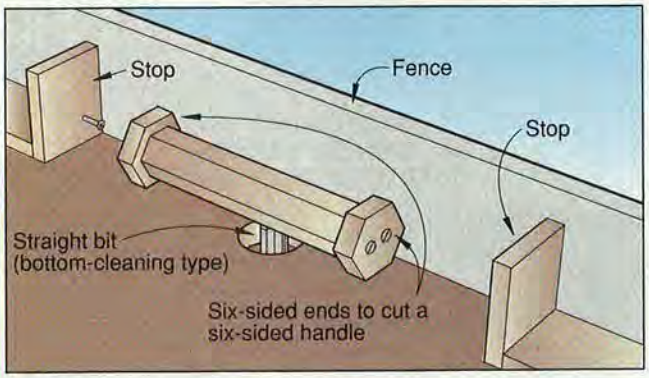
***—Charles L. Levine, San Francisco***

*Charles, use the following technique to make six- or eight-sided chisel handles:*

*1) Cut and square the piece of wood you wish to make into a chisel handle. These handles typically measure between 1" and 1½" in diameter, depending on the size of the chisel blade.*

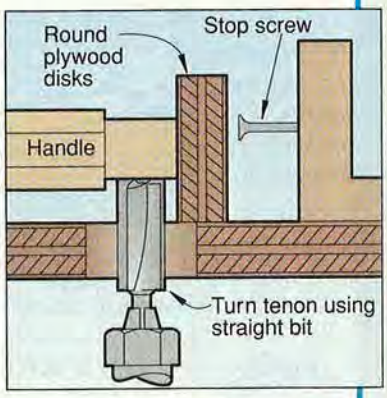
*2) Cut two six- or eight-sided end pieces from plywood, using the layout process as shown in the "Router-Table Turning" article from the April 1994 issue. To determine the diameter of the circle used in this procedure, measure the diagonal across one end of your turning square, and add ¼" to this measurement. Cut the hexagonal or octagonal end pieces to shape with a bandsaw, and sand to the lines with a disc sander.*

*3) Mount the six- or eight-sided end pieces on your turning square, using one screw centered on each end. Place this unit on the worktable, and rotate the square so that one flat face of the square is aligned with a flat on the end pieces. Lock the ends in place with a second, off-center screw.*




*4) Cut the sides of the handle using a bottom-cleaning bit in the router table. You can remove between ⅛" and ¼" of material per pass, but for a clean surface, remove only 1/16" of material on the final pass.*

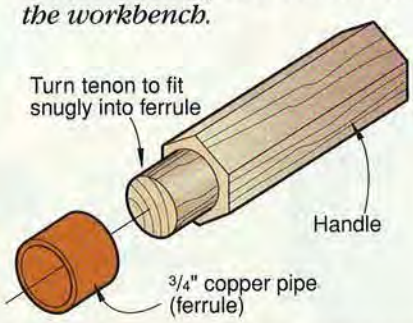
*5) To cut a tenon to fit a ¾" copper ferrule, first replace the six- or eight-sided ends with circular ends. Then, raise the router bit until it touches a side of the handle. Cut the tenon on one end,* as shown right. *Raise the router bit as needed to reduce the tenon size to fit the ferrule.*

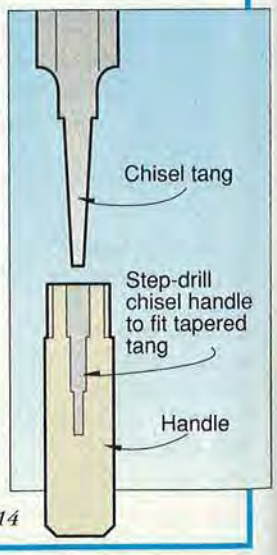



*6) Remove the handle from the ends, and press-fit the ferrule into place.*

*7) Step-drill a hole in the ferrule end of the handle to fit the chisel tang. Use three or four sizes of drill bits, with each smaller bit going deeper into the handle,* as shown right.

*8) Place the chisel tang in the tapered hole in the handle. Set the blade in place by tapping the butt end of the handle on the workbench.*

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# TALKING BACK

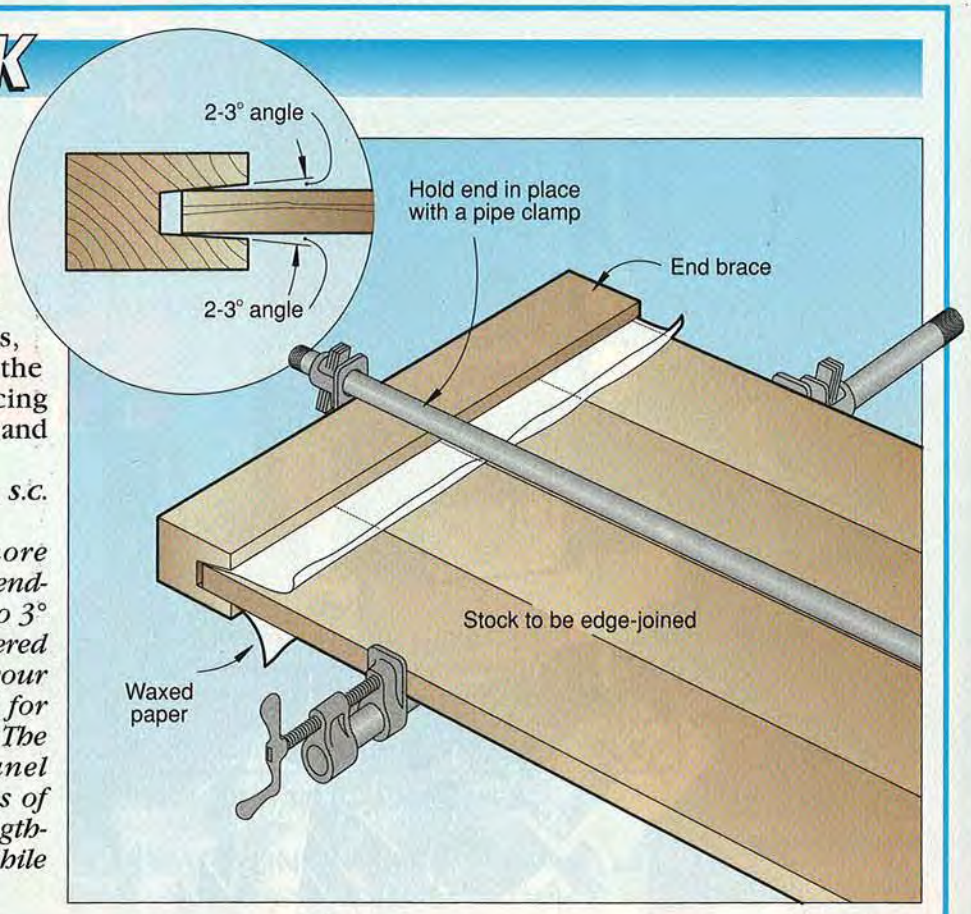
*Continued from page 12*

## End brace revisited

I liked Allen Formby's shop tip about the glue-up end brace in the April 1994 issue. However, I feel this end brace could be made more versatile by eliminating the glue squeeze-out clearance holes, cutting the dado 1/16" wider than the thickness of the boards, and placing waxed paper between the boards and the end brace.

***—Greg Carroll, Abbeville, S.C.***

*Good ideas seem to generate more good ideas, Greg. Why not cut the end-brace groove with the sides at a 2 to 3° angle? An end brace with this tapered groove, used in conjunction with your waxed-paper idea, could be used for more than one thickness of wood. The wedge-fit of the brace to the panel edges also will help align the edges of the boards. Apply a pipe clamp lengthwise to hold the braces in place while the glue dries.*

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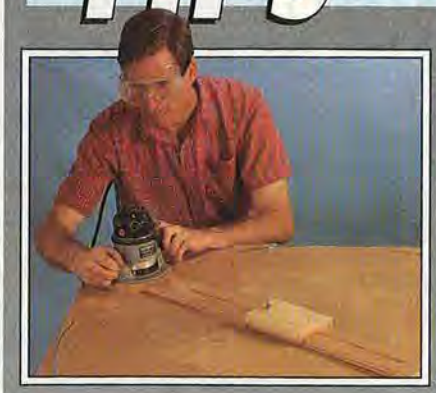
# TIPS FROM YOUR SHOP (AND OURS)



Several years ago, I tried sanding a rough-cut circle into a perfectly round shape. It took me a long time, and I never did get the shape of the circle quite perfect. If I would have known about Wilton Elwick's router-trammel idea, at *right*, I would have saved myself a lot of trouble. Like most good shop tips, Wilton's jig takes an hour or so to build, but it will save you many more hours of effort by giving you accurate, dependable results in just minutes.

If you come up with a new time- or labor-saving woodworking idea, jig, or fixture in your shop in the near future, let us know. Send a brief description of the idea and a drawing or photo to:

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If we choose your tip, we'll pay you $40, plus you'll get a shot at winning a new tool for the top shop tip. We try to avoid shop tips that have appeared in other magazines, so please send yours to only one. Also note that we cannot return submissions. Thanks, and keep sending those tips.

Tom Jackson
General Interest Editor

Print this article

## Cut perfect circles with a router trammel

*You need to cut a big arc or wheel out of a sheet of plywood, but you know that a hand-held jigsaw will leave a less-than-perfect circle.*

**TIP:** Make a trammel for your router, and you can whip out perfect circles or rings anytime. The pivot base and beam allow a wide range of size adjustments.

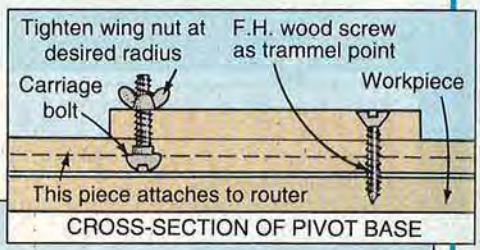
Using ¾" plywood for the trammel, cut out one end to match the shape of your router's base. For length, construct the jig so the beam measures about 12" longer than the radius of the largest circle you wish to cut. Make the narrow part of the beam 4" wide, and cut a ⅜" slot through it as shown in the drawing *below*. On the bottom surface of the beam, use your router to cut a 1"-wide groove ⅜"-deep for the head of the bolt to slide in. Next, cut the pivot base from ¾" plywood and drill a ⅜" hole for the carriage bolt 1" from the front edge.

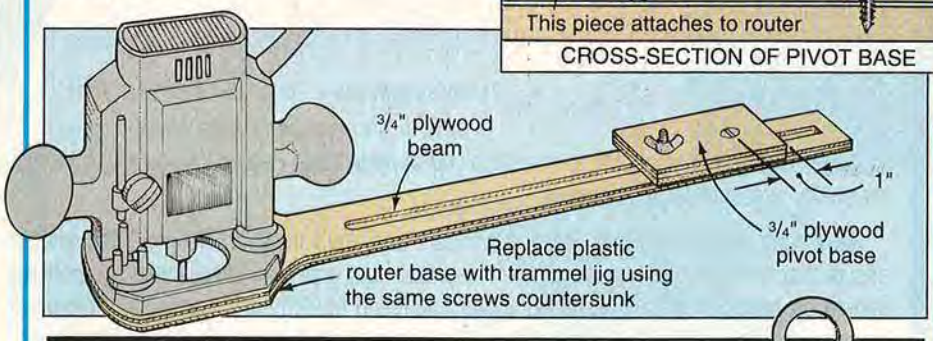
**Wilton will receive a DeWalt DW444 random-orbit sander with a 6" pad for his top shop tip.**

TOP SHOP TIP

Drive a screw through the base into the center of the circle to be cut and adjust the base until your router is correctly positioned. Tighten the wing nut on the carriage bolt, and rout your circle with a straight bit. If you're cutting a ring, cut the outside diameter first.

***—Wilton Elwick, Texarkana, Texas***


Tighten wing nut at desired radius
F.H. wood screw as trammel point
Carriage bolt
Workpiece
This piece attaches to router
CROSS-SECTION OF PIVOT BASE



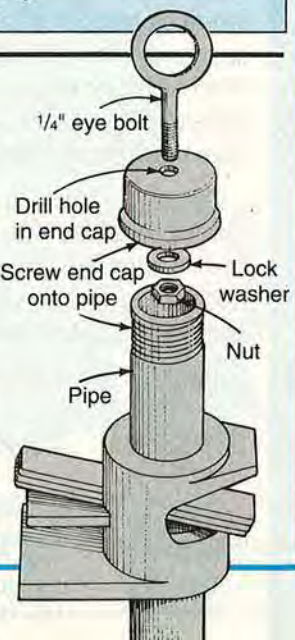

## End pipe-clamp storage problems

*Not all of us have a lot of room in our shops to put in a big rack for pipe clamps. Isn't there another way to store these handy helpers?*

**TIP:** Top your pipe clamps with an end cap and eye bolt, and you can hang the clamps anywhere you put a nail or hook. You'll find end caps in the plumbing-supply bins in the hardware store. Simply drill a hole through the top of the cap, insert a ¼" eye bolt in the hole, and secure it with a nut and lock washer. Screw this assembly onto the threaded end of your pipe clamps and hang 'em high.

***—Ernest W. Stewart, Sanford, Fla.***

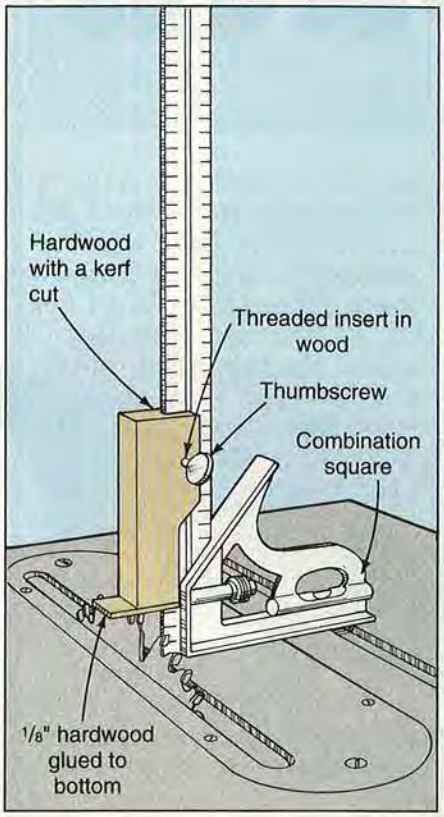
*Continued on page 18*



*Continued from page 16*

## Convert a combination square to a depth gauge

*Using a ruler or tape measure to set the depth of cut on a tablesaw or router table often proves inaccurate. Isn't there a better way to make these measurements, short of buying a special tool?*




**TIP:** Turn your combination square into an accurate depth gauge with two small pieces of wood, a thumbscrew, and a threaded insert. First, cut a ¾"-thick block of hardwood about 3" long, and cut a kerf down the middle just wide enough to fit over the edge of the blade on your square. Then, saw out the notch in the lower half of the block to fit around the head of the square.

Glue a piece of ⅛"-thick hardwood to the bottom, as shown *above*. With epoxy, secure a threaded insert into the upper half of the block, put in a thumbscrew, and you're ready to quickly gauge the blade height.

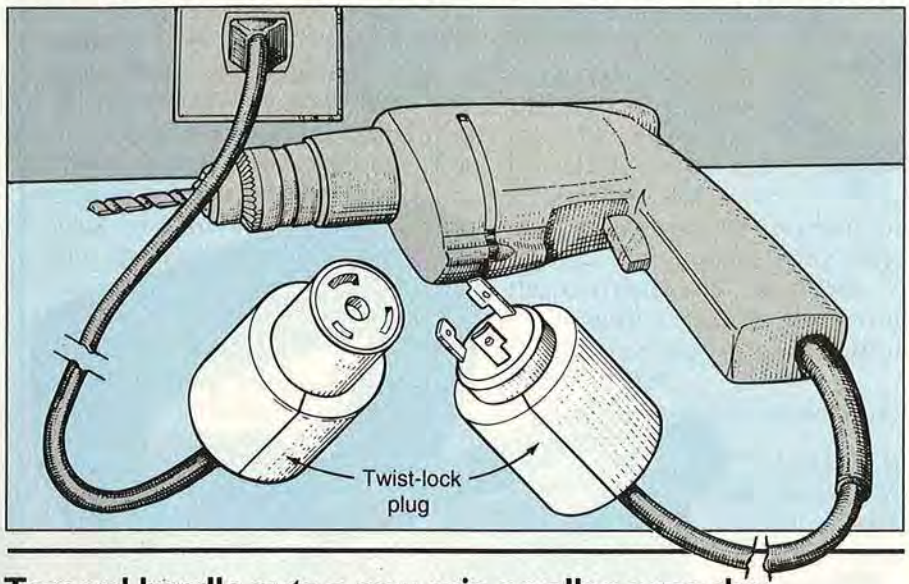
***—Mark Albrecht, Houston***

## Twist-lock plugs help childproof your power tools

*Kids imitate their parents, and that makes power tools a source of danger. How do you childproof the shop without locking it up?*

**TIP:** Attach twist-lock plugs to all your tools and then make a special twist-lock extension cord that you can hide. Cut the plug end of the cord on the tools you want to childproof and install a twist-lock plug, available at most hardware stores. Then, install a twist-lock receptacle on your extension cord. When you're done working, put away the adapted extension cord, and all your tools are safe.

***—Mike Stockford, Milton-Freewater, Ore.***



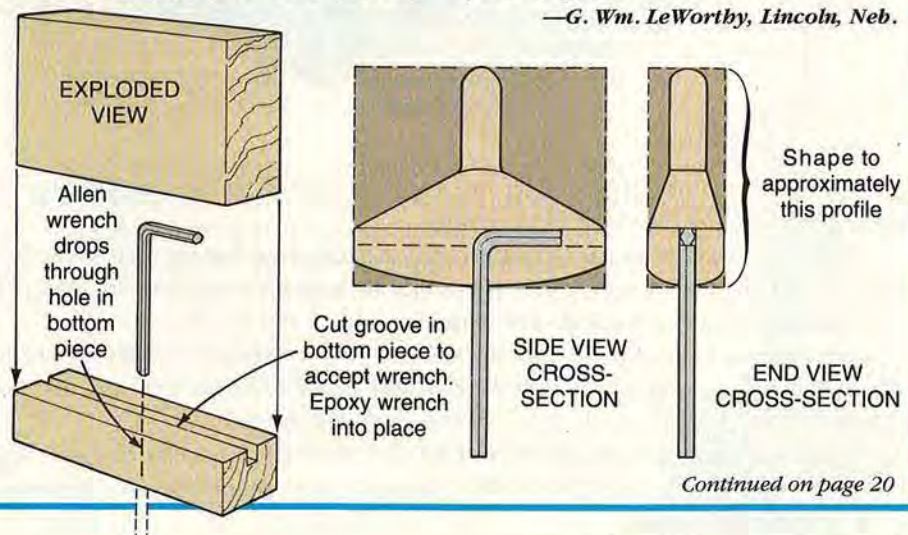

## Tapered handle puts a new spin on allen wrenches

*Applying the last few pounds of torque on an allen wrench sometimes puts a dent in your fingers. And if you make a large handle, you can't spin the wrench for speedy screw removal.*

**TIP:** Make a handle for each of your wrenches and then taper one end into the shape of a knob. With epoxy, anchor the allen wrench in a groove in a ¾×¾×3" block of wood, as shown *below*. Then, glue on a top piece that measures about ¾×2×3".

After the glue dries, cut the block to the approximate shape shown with a bandsaw or coping saw. Then, use a rasp, router, or sandpaper to round over the edges. Now you have a long handle for leverage and a narrow grip on the end that you can spin rapidly with your fingers.

***—G. Wm. LeWorthy, Lincoln, Neb.***


EXPLODED VIEW
Allen wrench drops through hole in bottom piece
Cut groove in bottom piece to accept wrench. Epoxy wrench into place
SIDE VIEW CROSS-SECTION
Shape to approximately this profile
END VIEW CROSS-SECTION

*Continued on page 20*

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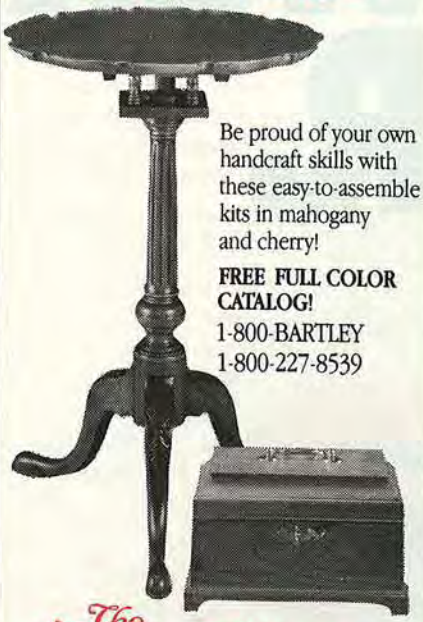

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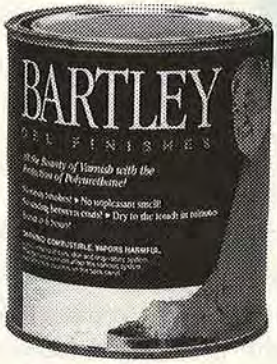


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## TIPS FROM YOUR SHOP (AND OURS)

*Continued from page 18*

### Benchtop machines won't walk with this hold-down

*Clamping and unclamping benchtop machines sure eats up a lot of time. But if you don't secure them, many will walk all over your bench, making work difficult and unsafe.*

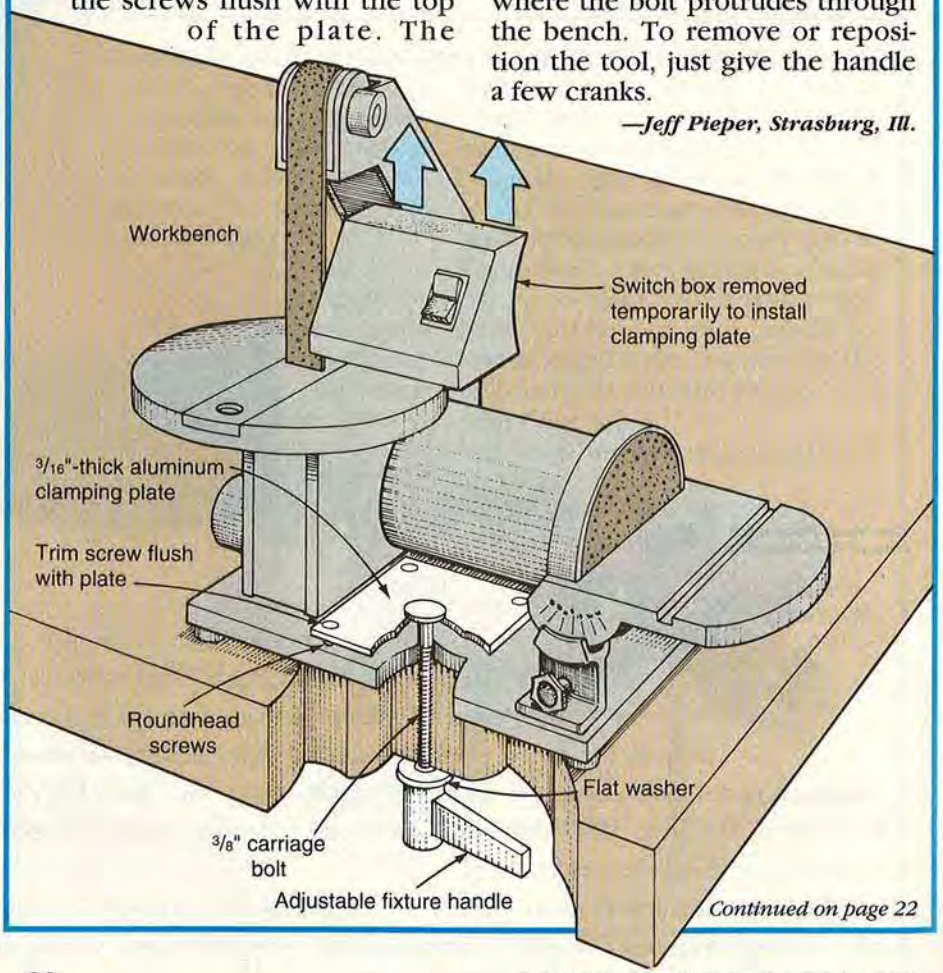
**TIP:** Attach a clamping plate to the base of your machine, and secure it to the bench with a carriage bolt and adjustable fixture handle. (You can get fixture handles of various sizes from The Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374-9514. Call 800/279-4441.) From a piece of 3/16"-thick aluminum, cut out a clamping plate that will fit inside the base of the machine you want to secure. For this Dremel Disc/Belt sander, a 3×3" plate works fine.

Drill and tap all four corners of the plate, install four ¼" roundhead screws with the heads down, and cut off the shanks of the screws flush with the top of the plate. The heads of the screws distribute the clamping force and prevent the tool base from bowing in the middle. (If you don't own a tap-and-die set, your local hardware store usually will thread the holes for you.) Next, drill a ½" hole in the middle of the plate for the carriage bolt.

Now, drill a hole through the base of the machine and drop a ⅜" carriage bolt through the clamping plate and tool base. (On some machines you may need to partially disassemble the housing to position the clamping plate.) Use a carriage bolt that is long enough to protrude through the clamping plate, your tool, and the benchtop.

Drill a ⅜" hole in your benchtop in a suitable location, and mount the tool and clamping base with the carriage bolt in the hole. Secure this assembly by tightening the adjustable fixture handle where the bolt protrudes through the bench. To remove or reposition the tool, just give the handle a few cranks.

***—Jeff Pieper, Strasburg, Ill.***




*Continued on page 22*

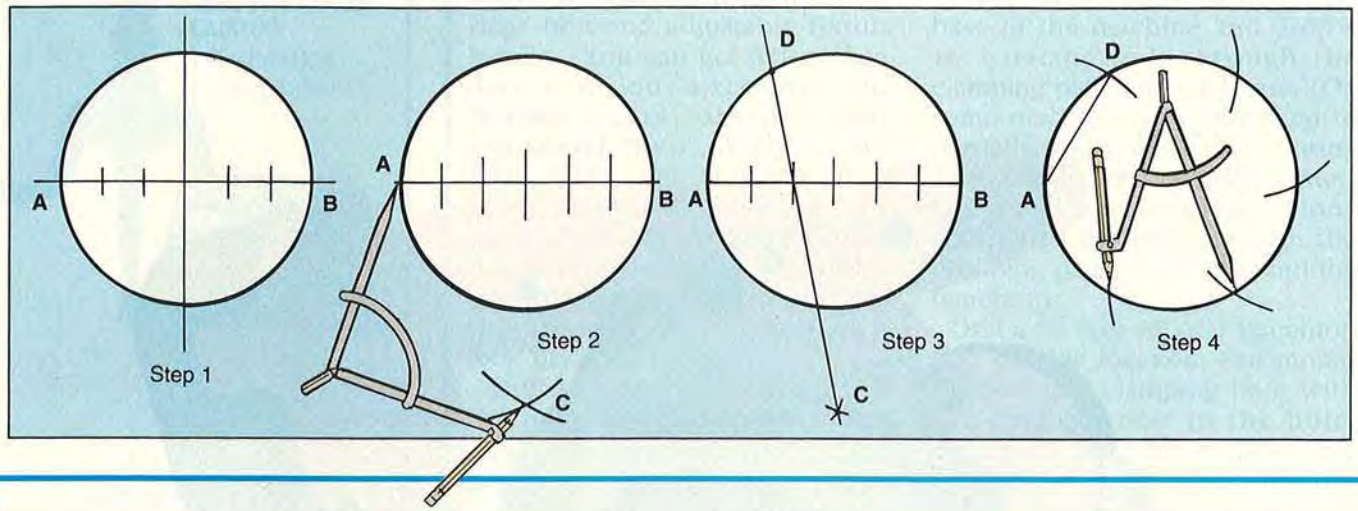
*Continued from page 20*

## Divide circles into any number of segments

*It's easy to divide a circle into four equal parts. Just draw two perpendicular lines through the middle. But when you want to put five, six, or seven spokes in a wheel, how do you divide the circle into equal segments without making a lot of complicated measurements?*

**TIP:** Call your high school geometry teacher, or follow along with this four-part procedure. **1.** Draw line AB through the center of your circle and divide it equally into the number of parts you want. (In the example shown, it's six.) **2.** Set a compass at points A and B, scribe the two arcs as shown, and label their intersection as point C. **3.** Draw a line from point C through the second mark on line AB and on through the outer edge of the circle, creating point D. **4.** Set your compass to the distance AD, and mark off equally spaced segments.

***—Vernon Raaen, Oak Ridge, Tenn.***

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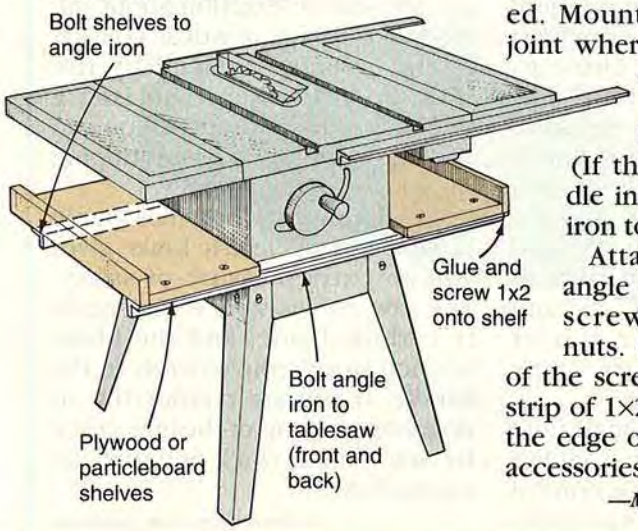
## Angle-iron rails support tablesaw shelves

*Every time you switch from the miter gauge to the rip fence you have to walk across the shop to put one or the other down. And then there's the problem of where to store the pushstick and other tablesaw accessories.*


Bolt shelves to angle iron
Glue and screw 1x2 onto shelf
Bolt angle iron to tablesaw (front and back)
Plywood or particleboard shelves

**TIP:** Build a pair of shelves below your tablesaw top, using two pieces of angle iron and some ¾" plywood or particleboard. Cut two pieces of ⅛×1×1" angle iron as long as the total length of your tablesaw top, extensions included. Mount these just above the joint where the legs and the saw enclosure meet, using three equally spaced 5⁄16×2" machine bolts. (If the saw's switch or handle interferes, bolt the angle-iron to the saw legs.)

Attach the shelves to the angle iron using ¼" machine screws, lock washers and nuts. Countersink the heads of the screws into the shelves. A strip of 1×2 glued and screwed on the edge of the shelves will keep accessories from falling off.

*—Marvin Ring, Corvallis, Ore.*

## A FEW MORE TIPS FROM OUR WOODWORKING PROS

- If you would like to modify your shop-made router table to accept sliding table jigs and fixtures, check out the process we came up with for routing parallel slots into tabletops as described on *page 51.*
- Need a pattern for a Yuletide star with long points? Look no further than *page 71.* Not only do you get a pattern, but we show you the angles so you can draw a star of any size.
- Looking for a standup Santa to brighten your home? Try bandsawing just the outside pattern line for the Santa puzzle on page *page 65.*

## Lightweight saw offers woodworkers new levels of convenience

Porter-Cable calls this newly designed 7¼" circular saw the Framer's Saw, but it has a lot to offer woodworkers, too. It incorporates almost every user-friendly feature a woodworker could think of.

For starters, this saw won't wear out your arm during an extended work session. It weighs just 10¼ pounds, about two pounds lighter than most other comparable saws. The company uses magnesium alloys in the baseplate and gear chamber to keep the weight down.

Dust collection matters when you work inside a shop, and this tool's 1"-diameter dust-collection chute works well when hooked up to a shop vacuum. The optional dust-collection bag, however, sometimes causes the chute to clog on beveled cuts.

To change the tilt and elevation settings, big, easy-to-grasp knobs give you a positive hold so you don't bust your knuckles. And the tilt settings roll over to 48° and 93°—nice for ripping hard-to-fit bevels. Positive stops at 45° and 90° mean you don't have to reset angles with a try-square or by other means.

On the baseplate, a small concave thumb rest near the front left corner makes it easier to control and guide the saw, especially when you're trying to keep the baseplate snug against a straightedge. And the right-side edge of the baseplate measures 1½" from the kerf—perfect for ripping matching pieces of 2× material.

I had doubts about the durability of the metal-alloy baseplate. So I put it in a vise and tried to bend it. With a lot of pressure, the baseplate will flex, but it returns to its original shape as soon as you let up. My only reservation about the baseplate is that sawdust collects in the pockets formed by the ribbed construction. This isn't a serious problem, though. You can get rid of the sawdust by tipping the saw over occasionally.

A 15-amp motor provides ample power, and an electric brake gives you an extra measure of safety. The saw comes with a high-quality carbide blade, and the blade wrench stores conveniently in the handle. If you are considering an upgrade to a top-of-the-line circular saw, I think you'll find this one a good buy.

***—Tested by Tom Jackson***

*Porter-Cable Framer's Saw, model 447, about $170. Porter-Cable Corp., P.O. Box 2468, Jackson, TN 38302-2468. Call 800/487-8665.*

## Clamp collars and bracket eliminate need for an assembly table

Gluing up large panels requires that you find the space to lay out boards and clamps. Most benches can't accommodate large panels, and an assembly table eats up a lot of room. To alleviate this space crunch, the Adjustable Clamp Company introduced Pony Mounted Clamp Collars for woodworkers who use ¾" pipe clamps.

To set up this system, you screw the 3'-long steel bracket at waist-level to your wall studs, using the 2" lag screws supplied. Then, you slide the pipe-clamp collars onto the bracket, insert the ends of your pipe clamps into the collars, and secure the pipe ends with the thumbscrews provided. At this point you can clamp your panels.

The ⅛" steel mounting bracket holds loads of up to 200 pounds using 3'-long clamps. The collars slide easily and lock to your pipe clamps securely. For stud spacing, the pre-drilled holes in the bracket are set on 16" centers, but you can drill through the bracket if you have studs spaced other than 16" on center. The company does not recommend attaching this system to a concrete, brick, or block wall. If that's what you have in your shop, you can mount a wooden frame on your wall and screw the bracket to that.

The collars sell for about $13 each and the bracket goes for about $19. You can also buy the two as a set, two collars and a bracket for about $40. If you don't have an assembly table or frequently struggle to find a space to glue up large panels, these Pony Mounted Clamp Collars will make a world of difference in your shop.

***—Tested by Bob McFarlin***

*Pony Mounted Clamp Collars. Adjustable Clamp Co., 417 N. Ashland Ave., Chicago, IL 60622. Call 312/666-0640.*

*Continued on page 26*

*Continued from page 24*

## Coated sandpaper cuts clogging and sawdust problems

Many sandpapers load up with pitch or resin long before they wear out, and changing the paper takes up valuable time. DeWalt recently introduced this bright-yellow sandpaper to solve the loading problem and to reduce dust accumulation in the shop.

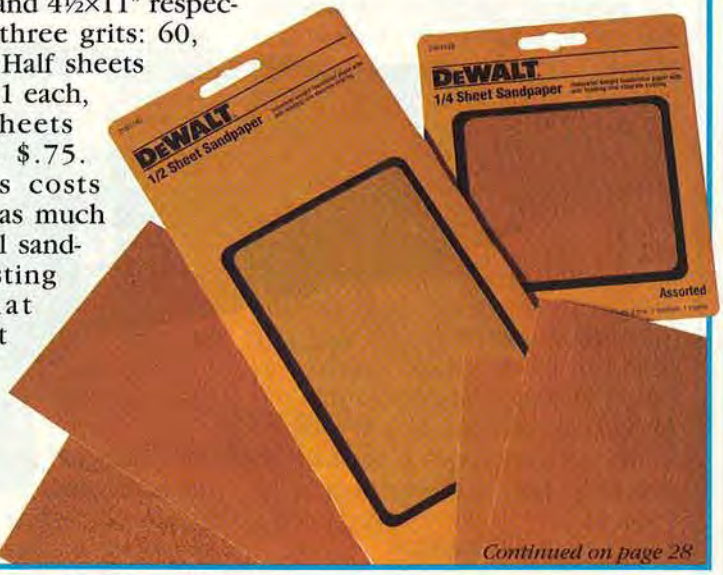
A zinc-stearate coating on the paper has a slippery quality to it, which means that pitch or resin won't stick to the paper. The coating also reduces the static charge on sawdust. Without a static charge, the dust won't cling to your tools and work surfaces, and this enables your dust collector to pull in more dust.

I tried the sandpaper on a few pieces of pine—one of the worst paper cloggers around. Even after several minutes of hard pressure with a palm sander, the paper showed no evidence of clogging or build-up. The lack of a static charge on the dust particles also made it easier for me to clean up and keep the shop dust free.

DeWalt sells this sandpaper in packs of half- and quarter-sheet sizes, 4½×5½" and 4½×11" respectively, and in three grits: 60, 100, and 150. Half sheets sell for about $1 each, and quarter-sheets go for about $.75. Although this costs roughly twice as much as conventional sandpaper, my testing indicated that this DeWalt sandpaper lasted at least twice as long.

***—Tested by Bob McFarlin***

*DeWalt Industrial-Grade Coated Sandpaper. DeWalt Industrial Tool Company, P.O. Box 158 Hampstead, MD 21074. Call 800/433-9258.*




*Continued on page 28*

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## PRODUCTS THAT PERFORM

SHOP TESTED

*Continued from page 26*

### For big or unusual situations, this clamp "can-do"

Most miter clamps work fine for small moldings and stock of equal thicknesses. But the Can-Do Clamp's swiveling lead screw and clamping head give it the ability to secure two boards of different thicknesses. And the clamp's 6" jaw width opens up possibilities beyond the size limitations of most picture-frame clamps.

I used the Can-Do Clamp to hold two unequal-width sash pieces for a storm-window frame. The clamp held both pieces firmly during my glue-up, even when I was driving screws in one end. If you use these clamps on finer projects, however, I recommend clamp pads—the painted steel surfaces of the clamping head and fences felt a bit rough.

Before I found this clamp, I usually built a jig whenever I needed to hold workpieces larger than a picture-frame molding. The Can-Do Clamp takes less time, and holds boards as well or better than any jig I've built.

***—Tested by Tom Jackson***

*Can-Do Clamp, 24.95 ppd., from MLCS, P.O. Box 4053, Rydal, PA 19046. Call 800/533-9298.*

*Continued on page 30*

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# PRODUCTS THAT PERFORM

SHOP TESTED

*Continued from page 28*

## You can brush or spray this water-borne lacquer

Many woodworkers love the look and durability of lacquer, but not everybody can afford the spray equipment it requires. With this water-borne formula, Wood-Tex washes away the problems that prevent amateurs from enjoying this professional finish

The Wood-Tex Water-Borne Lacquer System contains two parts: a sanding sealer for bare wood, and the clear finish. I found that one coat of the sealer works fine on hardwoods. Softwoods required two coats—the first one to raise the grain so that you can sand it smooth again, and a second coat to even out the first. In my tests, the grain raising proved to be minimal, and the sealer dried quickly, in about 20 minutes. The finish coats also dry quickly. I allowed 15 minutes between coats using a spray gun.

What makes this product valuable to the home woodworker is that you can apply it with a brush. My brush-applied coats took about twice as long to dry because of their greater thickness, but that's still fast enough to prevent a lot of dust from settling on the work surface.

The product gives off a slight odor, but it's not bothersome. And everything cleans up with soap and water. If you spray, you still need a respirator and ventilation, but there's no need for toxic solvents and explosion-proof ventilation fans. For home woodworkers, I recommend this finish on that basis alone. Even for guys like me who have all the spray equipment for regular lacquer, this new formula still offers a lot of convenience and speed.

***—Tested by Bob McFarlin***

*Wood-Tex Water-Borne Lacquer System, one gallon of sanding sealer $19.95; one gallon of satin or gloss lacquer $26.34 (these prices do not include shipping). Woodworkers Supply, 1108 North Glenn Road., Casper, WY 82601. Call 800/645-9292.*

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# WOOD ANECDOTE

Print this article

## PERUVIAN WALNUT

### THE WOOD WITH A LONG, LONG WAY TO GO

One way to get Peruvian walnut into the hands of woodworkers is to load it on pack mules for a slow mountain crossing.

When North American woodworkers yearn to work a lovely wood, they frequently turn to black walnut (*Juglans nigra*). At around $4 or more per board foot, it's pricey but worth the cost.

Peruvian woodworkers like working walnut, too, but they have a different species in mind. For cabinets, fine furniture, and musical instruments, they think of *Juglans neotropica*, or *tocte*. It looks and works very much like its northern cousin, yet its cost in *sols* (the Peruvian monetary unit) can be as much as 10 times more. That's because very little tocte ever finds its way to town.

Tocte, it seems, grows best at elevations of 5,000-8,000 feet above sea level. And in Peru, that describes some nearly inaccessible mountain valleys. In fact, this tropical walnut can be brought to woodworkers' shops by only two means. The first—and easiest—involves rafting logs down dangerous river rapids from the mountains to the coast.

The second method, although safer, requires stowing short lengths of tocte on pack animals and hauling it at a snail's pace across part of the Andes Mountains to a city that has rail or highway connections. This tedious journey accounts for tocte's cost and limited availability. So don't ever count on it showing up at your favorite hardwood supplier, unless the business happens to be in Peru.

Illustration: Jim Stevenson


"the woodworker's warehouse"
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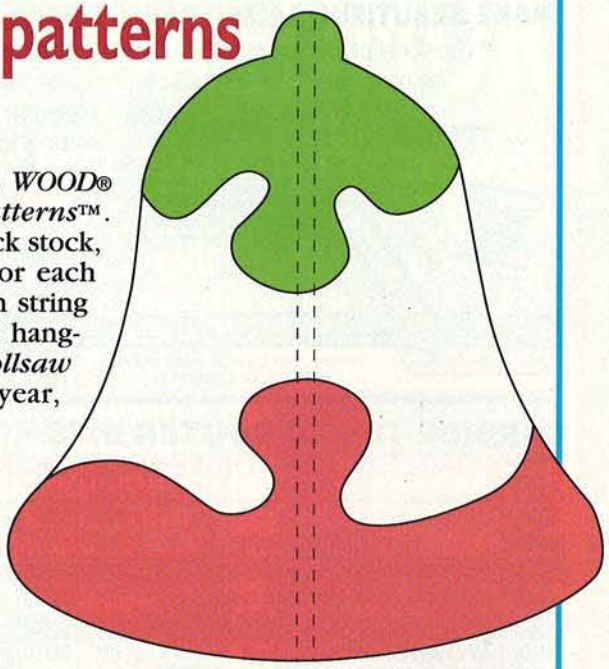

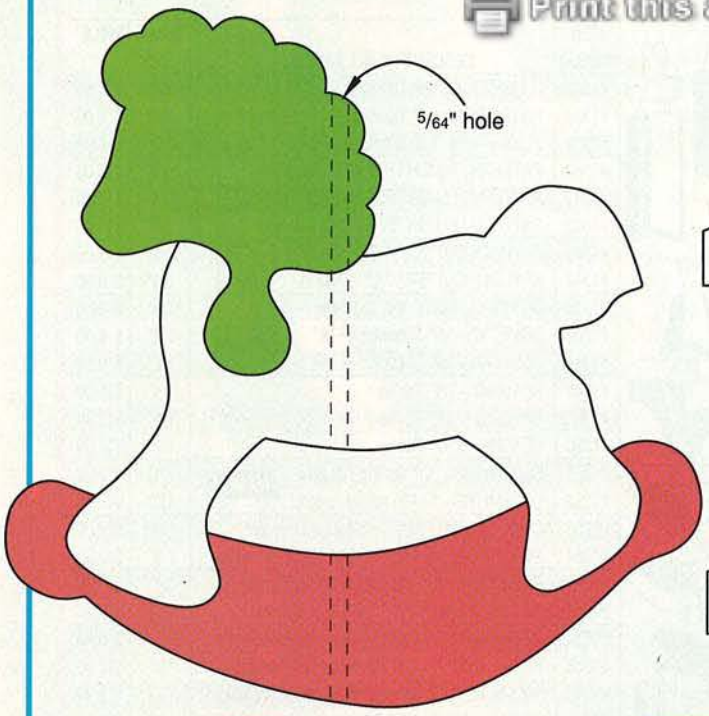


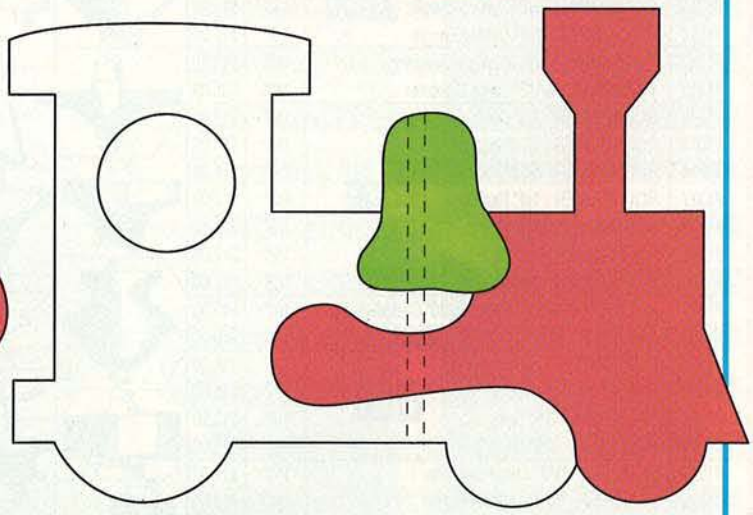

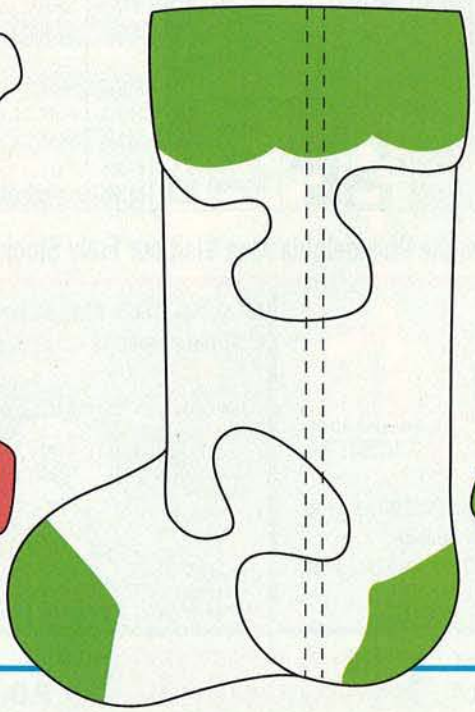

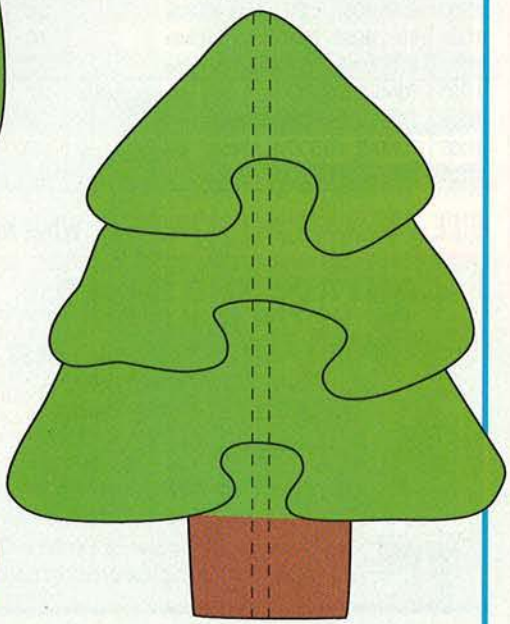

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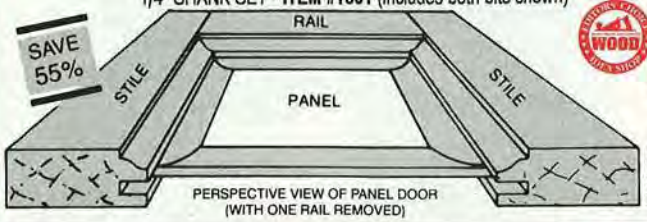


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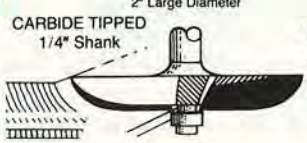


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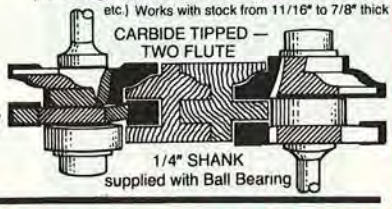


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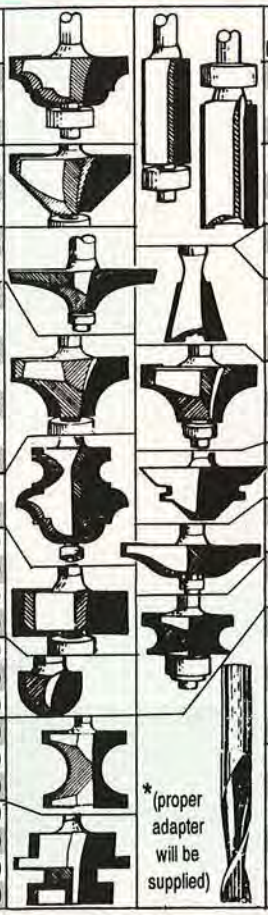


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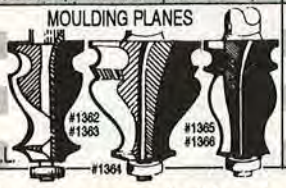


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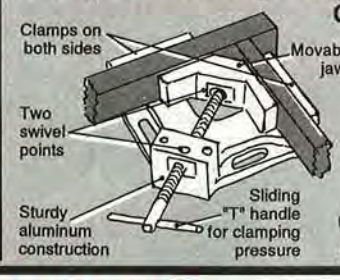


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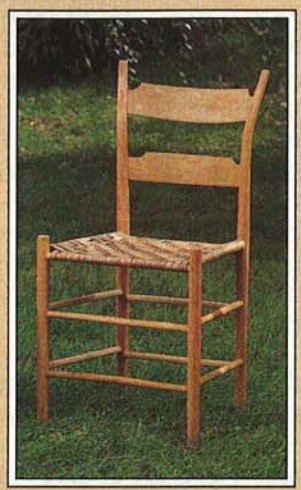
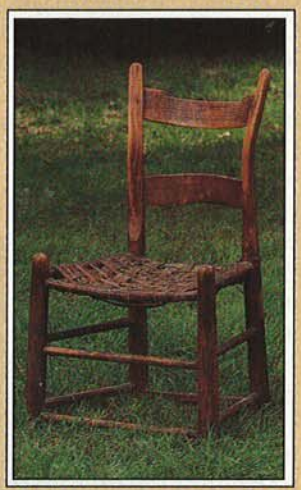
# THE BODGER OF BALTIMORE

## He builds chairs from green wood

**Back before the invention of power tools, woodworkers used their wits and well-sharpened hand tools to make furniture. In England, those who made chairs were called bodgers, and over the last 100 years or so, their methods almost disappeared. With an archaeologist's gift for research and a love of woodworking, John Alexander has resurrected their craft.**

*Continues*





**The chair in the *top* photograph is one of John Alexander's. The one *below* was built by an unknown 19th-century American craftsman.**

# THE BODGER OF BALTIMORE

Except for the occasional clash of a mallet and froe, this kind of chairmaking—called bodging—proceeds quietly. You won't hear any howling power tools. John's chairs spring to life from the edges of a few simple hand tools. In his backyard, John and his co-worker Peter Follansbee work hard, but you can still hear birds chirping, kids laughing, and the Saturday morning hubbub of this Baltimore neighborhood. Conversations flow easily. And John—a lawyer by day and a weekend bodger, teacher, and researcher of chairmaking and 17th-Century joinery—has a lot to say.

## A teacher (and a student) of the old hand ways

Each summer John and Peter teach classes at Drew Langsner's Country Workshops in North Carolina for people who want to learn traditional chairmaking and joinery. "We usually get two kinds of students," says John. "There's the Connecticut cabinetmaker who thinks he has to turn everything on a lathe and measure it with dial calipers. Then there's the little old lady in tennis shoes who has never done any woodworking in her life. But by the end of the course, the little old lady is having a blast, and the Connecticut cabinetmaker—unless we've broken him of his perfectionist mentality—is a nervous wreck."

Teaching comes easily to John. He combines a teddy-bear-like friendliness with a trial-lawyer's instinct for holding his audience. At the same time his students are learning how to hand-craft a slat-back chair, John also throws in a liberal dose of traditional-woodworking history.

The original bodgers, as John explains, wandered from town to town across the English countryside. They would camp on the outskirts of a town, fell some trees, split out posts, and turn legs and spindles. The turned parts were then sold to craftsmen who used them to build Windsor chairs. Unlike his predecessors, John does not turn the chair parts. He uses a simpler and faster technique of shaping the parts with a drawknife and spokeshave.

John has studied traditional woodworking, he calls it green woodworking, for the better part of 20 years. In doing so, he has gained a rare knowledge of how wood works when it's wet, how it moves as it dries, and how to exploit its natural strength. This same knowledge enabled the craftsmen of old to create a lot of furniture in a hurry without glue or power tools. It also can help any craftsman today understand and appreciate the character of the wood they work.

John discovered that you can work green wood freshly split from a log without hours of back-breaking labor. The key is understanding how the grain direction serves as a guide and blueprint for the parts you need. When John makes a chair, knowledge replaces electric power.

## Start with straight grain

John's chairs start out as bolts of oak or hickory about 3-4' tall and 12-24" in diameter. To get straight, warp-free pieces John must harvest the wood from a straight tree trunk.

"Branches and trees that lean grow in tension," explains John. "To keep a leaning tree or branch upright, the wood fibers push on one side and pull on the other. When the tree is split or run through the sawmill, this hidden tension springs back, causing the boards to warp and twist." Such a piece of wood is of no use to a bodger, who needs straight grain.

Once he's found a good straight bolt, John usually starts to work immediately. If not, he'll seal the ends with latex paint or store the bolt underwater to retain the wood's moisture. "Green wood cuts just like cheese," says John.

## Splitting a chair from a tree with a mallet and froe

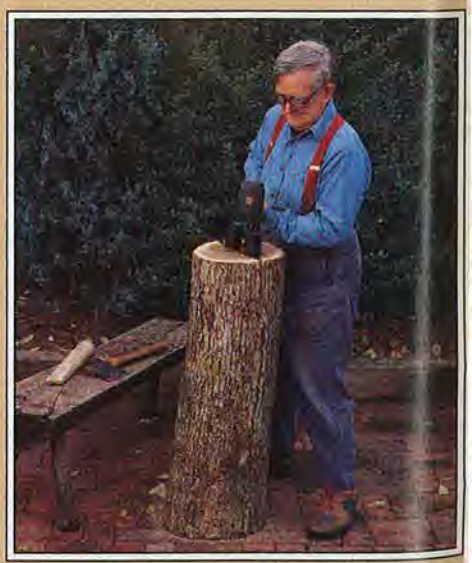
The chairmaking process starts when John splits the bolt open with a wedge and then quarters it. John examines the grain carefully, and with a mallet and froe (a long piece of iron with a wedge-shaped profile) splits out one or two chair posts from the heartwood of each quartered section of log.

With the posts split out, it's time to saddle up the shaving horse. This trademark tool of the bodger serves as a combination bench and vise. To use the shaving horse, John sits on one end and pushes with his foot on the treadle, which forces a clamping head down on the workpiece. This gives him two free hands for wielding a drawknife.

Shavings fly as John shapes the the four-sided billet into an octagonal post with his drawknife. The work requires a rapid-fire coordination of hands and feet—clamp, carve, unclamp, turn, clamp, and carve again. Later John will continue shaping the octagonal post with a spokeshave and turn it into

## Bodging by the Numbers...

**1** John fires the opening salvo on a pair of wedges that will split open this bolt of oak.

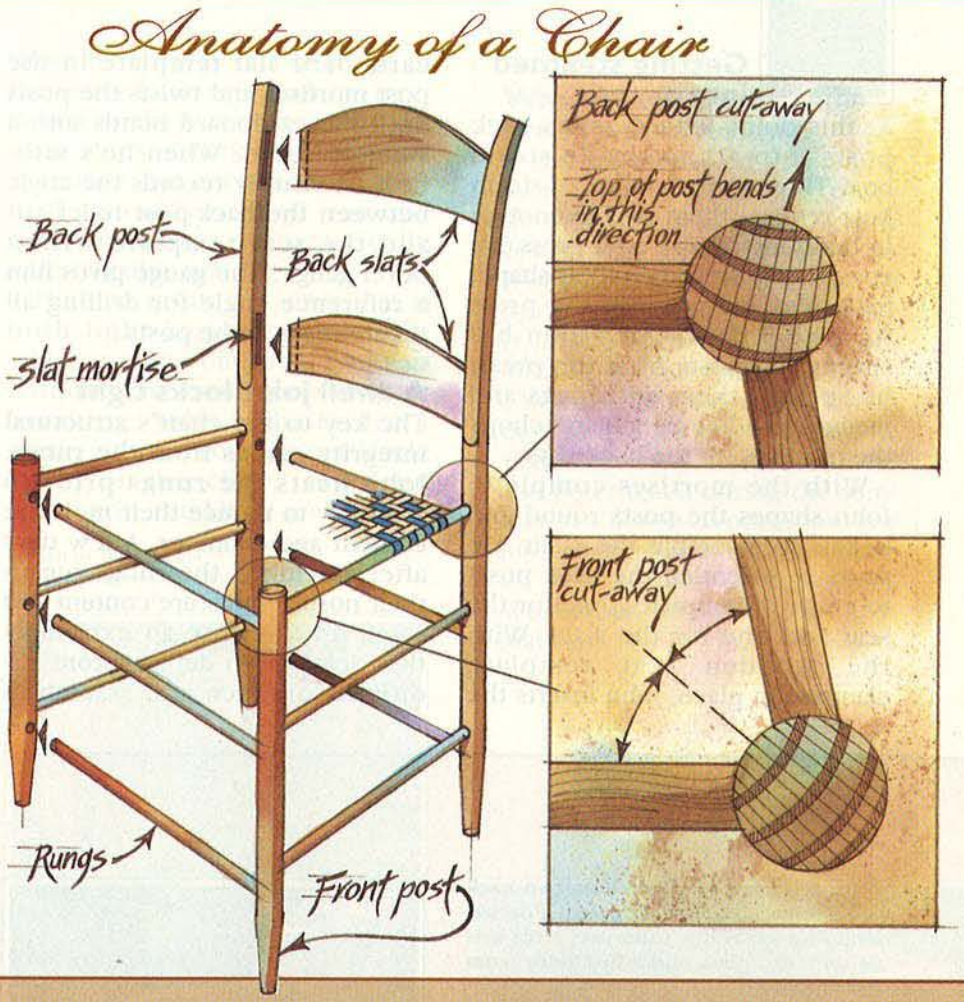


**Grain orientation can make or literally break a chair. In the cutaway drawing shown *right*, the straight lines on the posts represent the medullary rays on an oak post. The slash lines show growth rings.**

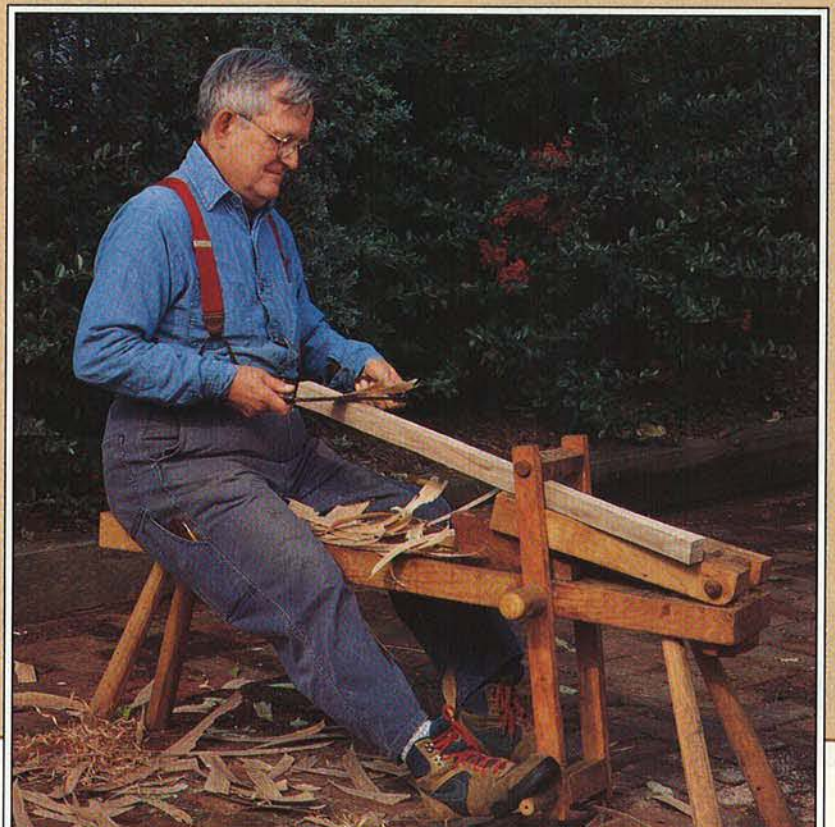
**On the front post cutaway the medullary rays align so that they receive the thrust from the rungs equally, thus reducing the possibility that the rungs can split the post. On the back post cutaway, you must turn the medullary rays slightly to the rear to avoid splaying the tops too far to the right and left.**

a round chair post about 1-1½" in diameter. John also shaves a flat relief cut onto the tops of the back posts to make them easier to bend later.

In a similar sequence, he shapes shorter, smaller pieces for rungs. The shaping stops with the spokeshave, and the use of sandpaper or any further tooling is forbidden. "You don't want to waste a lot of time trying to make it perfect," says John, a bit out of breath. "In the 17th-century, they had more important things to do than make perfect furniture. The eye is very forgiving."



**2** After quartering the bolt, John rives the billets for the posts with a froe.



**3** The shaving horse enables a bodger to clamp and release the post with foot pressure on the treadle bar. This leaves two hands free to wield a drawknife or spokeshave.

## Getting steamed into shape

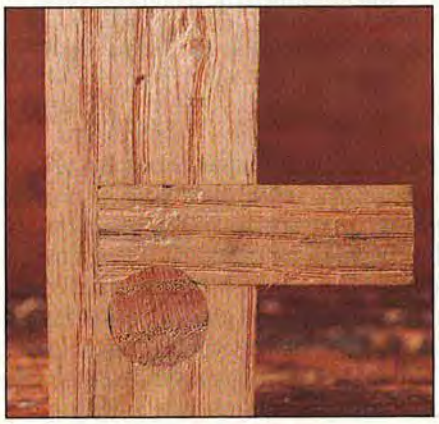
At this point John puts his back posts into a homemade steam box. Three to four hours of steam heat renders them pliable enough to bend into shape on a press. To ensure that they keep their shape, he leaves the posts in the press for 4 to 5 days. Once John has sprung the posts from the press, he secures them with pegs and wedges to a low bench and chops the mortises for the back slats.

With the mortises complete, John shapes the posts round and begins to assemble the chair. He starts by orienting the back posts to a pair of templates, one for the seat and one for the slats. With the wooden seat template clamped in place, John inserts the cardboard slat template in the post mortises and twists the posts until the cardboard bends into a suitable curve. When he's satisfied, he visually records the angle between the back-post relief cut and the seat template with a bevel gauge. The gauge gives him a reference angle for drilling all the mortises in the posts.

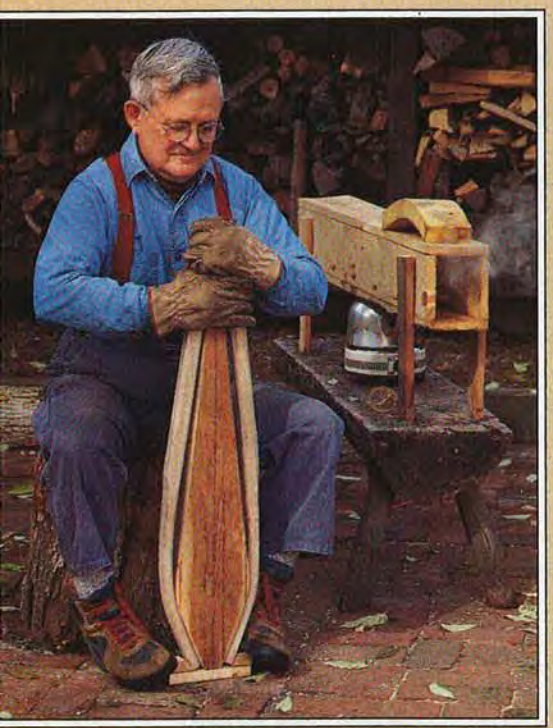
## A swell joint locks tight

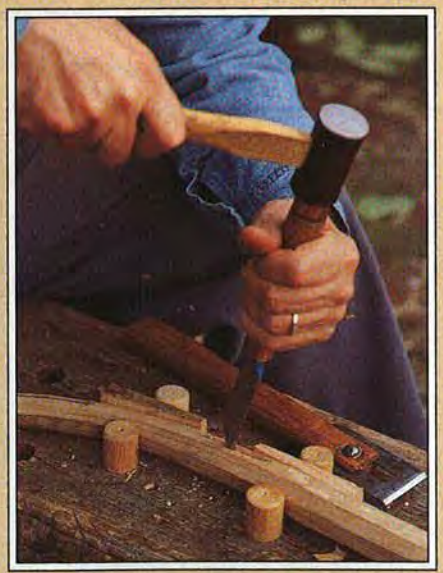
The key to the chair's structural integrity comes from the rungs. John heats the rungs prior to assembly to reduce their moisture content and diameter. A few days after assembly, the rungs regain their normal moisture content and swell up to create an extremely tight joint. John departs from traditional practice and assembles the sides of the chair first. Then he drills the mortise holes for the front and rear rungs so that they cut into the side rungs to create an interlocking joint.

**This cross section of a chair post shows how the side and front rungs interlock.**



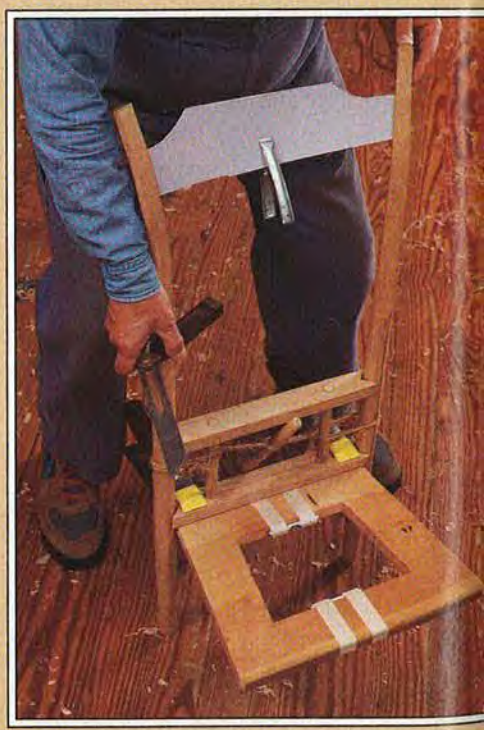
**4 Fresh from the steam box, two back posts take shape on a press. For his steaming apparatus John uses a tea kettle on a hot plate and a box built from 1×6" lumber.**





**5 Wooden pegs and wedges enable John to secure the post for chopping the slat mortises. The octagonal post is easy to hold in place at this stage—before it's shaped round.**

**6 John orients the two back posts with templates for the seat and slats. The goal: align the relief cuts on the back posts so that the back slat conforms to a comfortable curve.**



With the posts and rungs assembled, John turns his attention to the back slats. These he splits out of a short bolt of oak and shaves down to between ⅛–3⁄16" thick while they're still green. Once the slats are shaped, he boils them so that they will bend to fit the curvature of the back of the person who will use the chair. The slats lose their pliability quickly, and it may take several boilings to get the slats of a chair to feel just right. Both John and Peter test-sit each chair slat. When in doubt about the fit or feel, John calls in his wife Joyce for a test-sitting. John finishes his chairs by burnishing the wood with a handful of shavings, and then applying a light coat of tung oil or Danish oil.

The seats he saves for last, and these he weaves out of strips of the inner bark of a hickory tree. When soaked in water, the 1"-wide strips of bark work as easily as leather. But once they dry, they turn as tough as band iron and make a flexible yet practically indestructible seat.

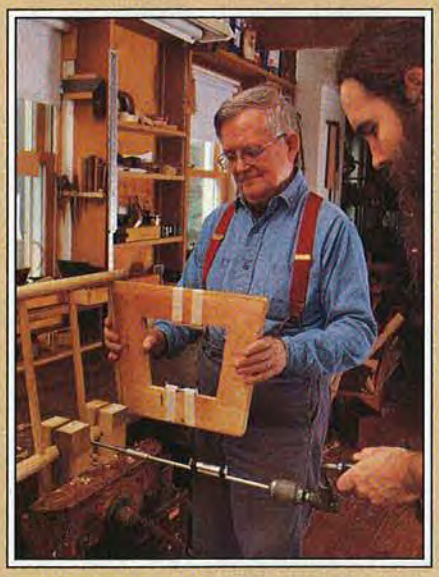
The end result is a chair that is both light and strong, one in which you can tilt up on two legs without the joints loosening or breaking. John's chairs don't creak, either. "You can put Uncle Tubby on this chair," says John with a grin, "and have no fear."

Written by Tom Jackson
Photographs: Steve Uzzell
Illustrations: Jim Stevenson

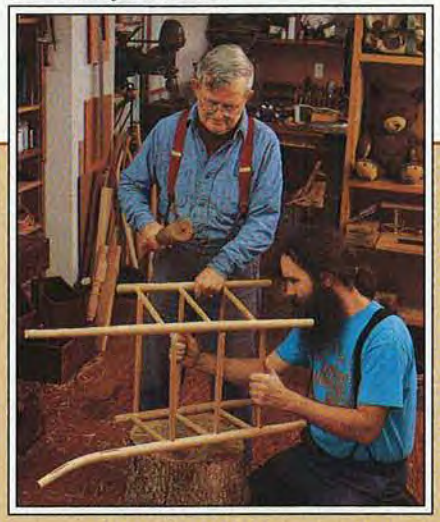
### Want to try traditional green woodworking?

If you are interested in learning more about chairmaking, order the book *Make a Chair from a Tree: An Introduction to Working Green Wood*, $22.45 ppd., from John D. Alexander Jr., 1406 Light St., Baltimore, MD 21230. Call 410/685-4375.

You also can sign up for a five-day course on chairmaking or 17th-Century joinery that John and Peter teach during the summer at Country Workshops. For more information on the courses, write to John or to Country Workshops, 90 Mill Creek Road, Marshall, NC 28753.

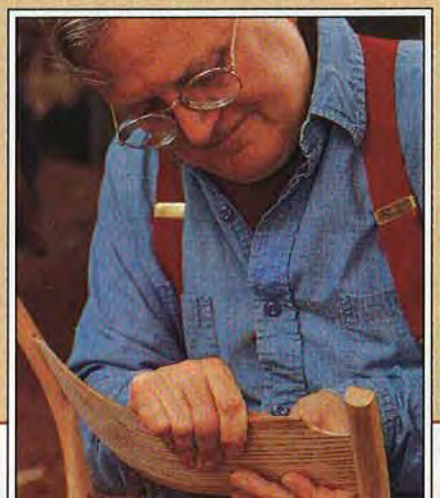


**7** Peter Follansbee, John's co-worker drills the mortises for the rungs while John holds the seat template. Spirit levels taped to the seat template and the drill bit extender ensure that the mortises are drilled at the correct angle and line up with each other.



**8** With the chair rungs fresh out of the oven, John and Peter quickly assemble the chair. As the rungs regain their moisture, they swell up and lock tight in their mortises.

**9** John uses hand pressure to pop a back slat into its mortise.



**10** Peter weaves the seat out of moistened strips of the inner bark of hickory. The wet bark works like leather. Once dry, it's as tough as band iron.

# CARBIDE ROUTER

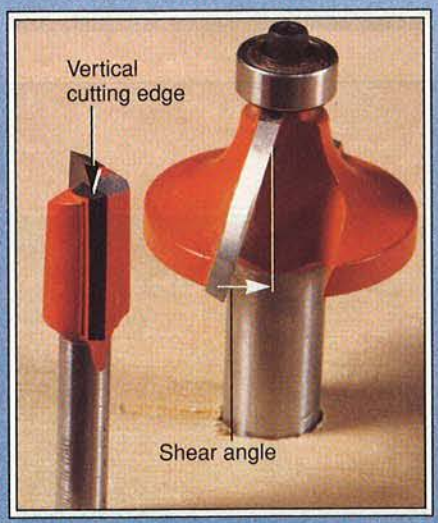
**Spinning at 22,000 rpm, a two-flute router bit takes 733 bites of wood every second—much more punishment than you dish out to the cutting edges of most other tools. In order to survive such abuse, router bits are manufactured to exacting specifications. But if you check the prices on two seemingly identical bits from different manufacturers, you may find that one costs twice as much as the other. Why?**

**To answer that question, we rounded up four bits each from 18 manufacturers—a straight bit, a core-box bit, a round-over bit, and a panel-raising bit. We looked at the sharpening and grinding quality of each bit and routed hundreds of lineal feet of oak, pine, and plywood. In the end, we found a lot of little differences that can make a big difference in your woodworking. And we came up with a list of 10 questions you should ask when shopping for router bits.**

## 1. Does the bit have a shear angle?

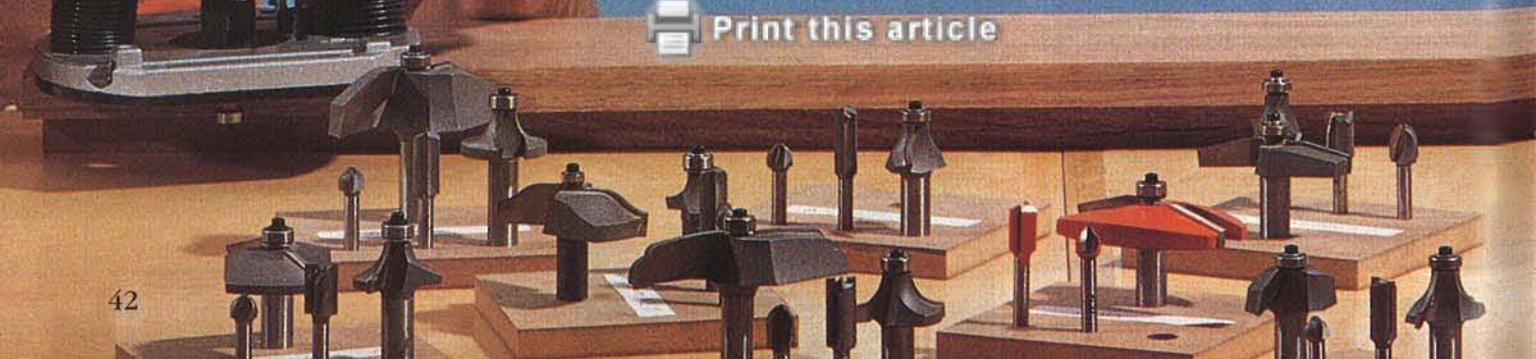
The forward tilt of the cutting edge on the round-over bit at *right* is what manufacturers call a shear angle. Shear angles allow the cutting edge to slice rather than chop the wood. This produces a smoother cut with less effort from the router motor. Look for shear angles on larger bits and edge-cutting bits such as round-overs.

In a plunge cut, a bit with a shear angle routing across the grain may cause some tear-out at the top of a groove or dado as the cutter lifts up and away from the edge. But the alternative, a completely vertical cutter, may leave a bit of fuzzing. All the straight bits we tested have vertical cutters since the fuzzing is easier to sand off than the tear-out that an angled cutter would cause. Routing with the grain, however, you'll get neither fuzzing or chipping. And since core-box bits are used primarily in fluting operations with the grain, all of these bits, except Porter-Cable's, have a slight shear angle.




**The shear angle on the cutting edge of the round-over bit, right, helps it slice through wood. The lack of shear angle on the straight bit, left, makes the router work harder, but prevents chipping on the top of a dado or groove.**

Print this article

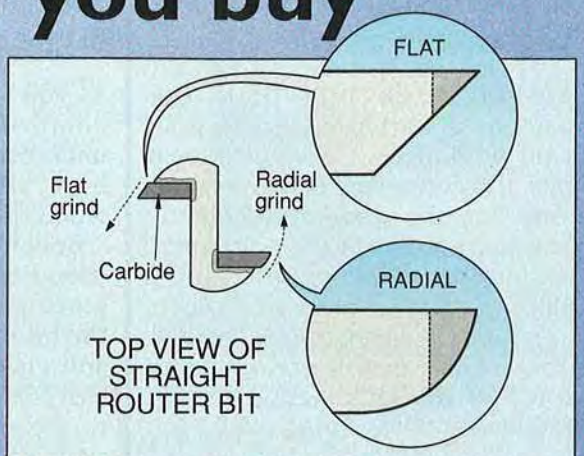


# BITS 10 questions you should ask before you buy

## 2. (For straight bits) Is the relief angle flat or radial ground?

To prevent burning, the carbide directly behind the cutting edge of a bit must be ground or "relieved" so that it doesn't rub against the wood. On straight bits, this relief is ground either flat or radial, as shown in the drawing *right*.

The radial grind leaves more carbide behind the cutting edge, and manufacturers who offer this type of grind claim the extra mass reduces chatter and keeps the edge sharp longer. In our tests, we did not detect any difference in performance or quality of cut between flat- and radial-grind bits. But, the extra carbide on radial-grind bits will reduce the slight shrinkage in diameter you get when you have your bits resharpened. The straight bits that have a radial grind include Amana, Bosch, CMT, DML, Eagle America, DeWalt, Oldham, Sears, Vermont America, and Whiteside.



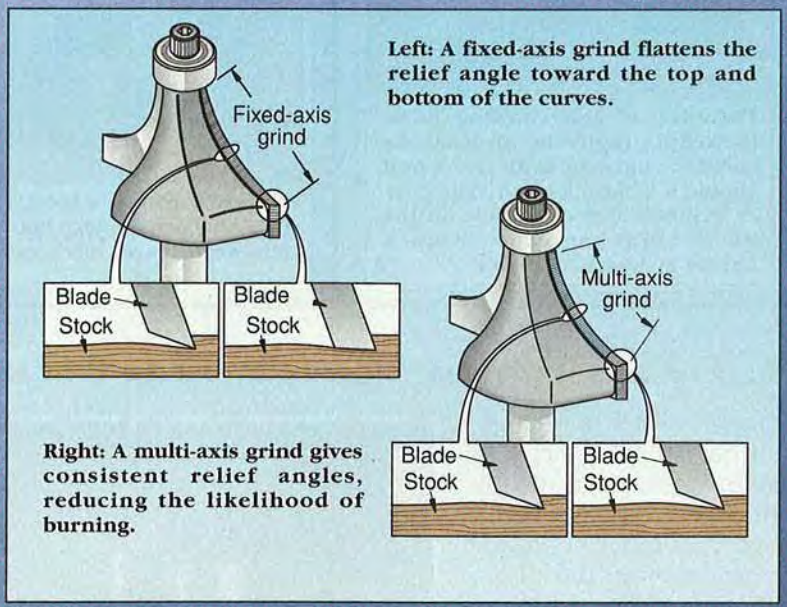

**A radial grind on the backside of the carbide puts more mass behind the cutting edge than does a flat grind. This helps to prevent shrinkage in the bit's diameter when resharpening.**

## 3. (For curved-profile bits) Is the relief angle fixed-axis or multi-axis?

Grinding the relief angles on curved-profile bits (like ogees and round-overs) gets more complicated. If manufacturers use a fixed-axis grinding stone, the relief angles flatten out near the top and bottom of the curves, as shown in the drawing *right*. These flat relief angles can compress the wood and increase the likelihood of burning, especially after the cutting edge dulls.

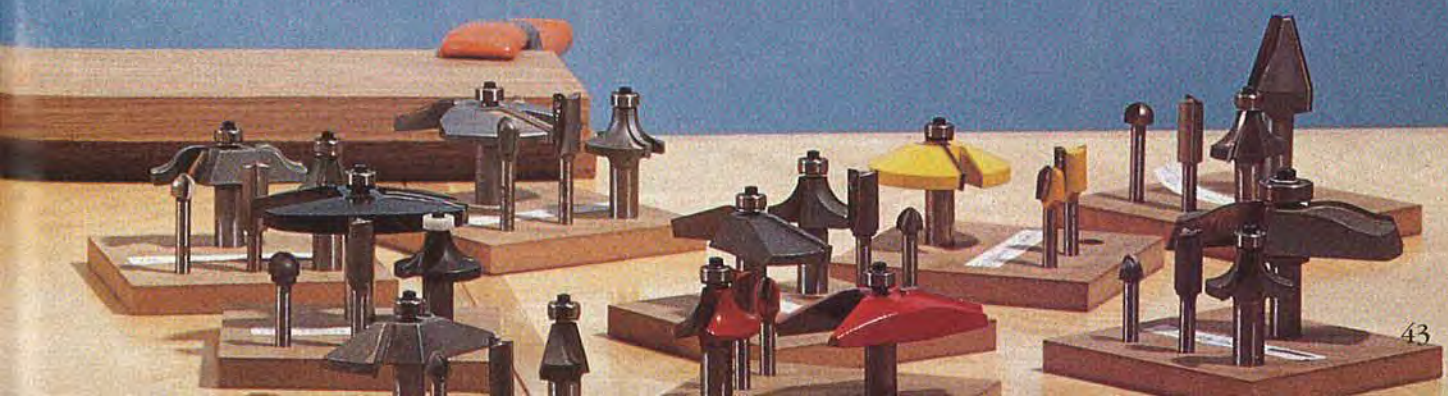
The solution: a multi-axis grinding machine tilts the grinding stone to follow the curved profile of the bit. This gives the bit a consistent relief angle across the back edge of the carbide. We observed a multi-axis grind on the round-over bits from Amana, Bosch, CMT, DeWalt, DML, Eagle America, Freud, Porter-Cable, Sears, Vermont America, and Whiteside.

*Continued*




**Left: A fixed-axis grind flattens the relief angle toward the top and bottom of the curves.**

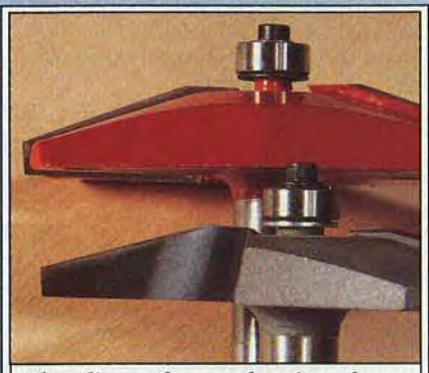
**Right: A multi-axis grind gives consistent relief angles, reducing the likelihood of burning.**



# CARBIDE ROUTER BITS

## 4. Are anti-kickback bits worth the cost?

Anti-kickback bits limit the amount of carbide that can grab your workpiece. On conventional bits, the entire face of a cutter can slam into the wood and violently jerk the router out of your hands. Anti-kickback bits expose only a sliver of carbide to the workpiece, as shown in the photo *below*. These bits can still grab, but the force of the kickback is greatly reduced and less dangerous.



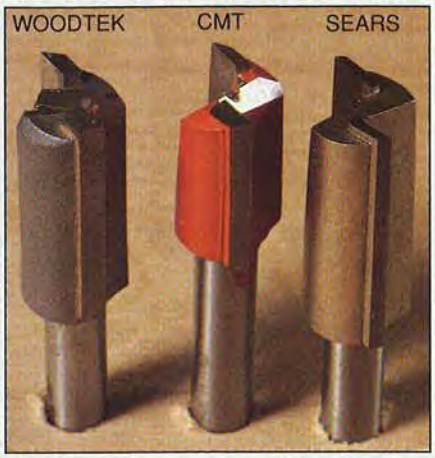
**The sliver of gray showing above the red on the Freud bit is all the carbide that can grab the wood should a kickback occur. The larger exposed area of carbide on the bit in front can cause a much harder kickback.**

## 5. (For plunge cutting) How steep is the relief angle on the bottom of the bit?

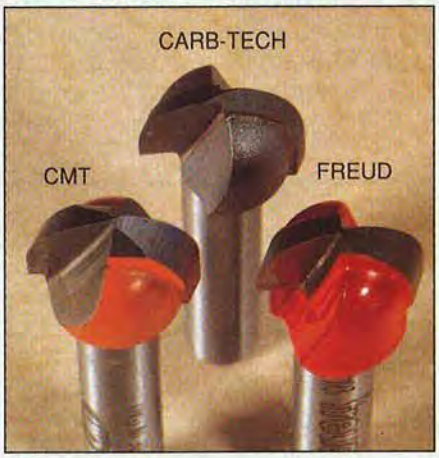
As you start a plunge cut, the bit compresses the wood directly underneath it. To prevent burning here, the bit must remove this wood quickly and cleanly.

Bosch, Carb-Tech, DML, and Woodtek braze an extra carbide cutting tooth on the bottom of the bit to help smooth the bottom and clear debris. CMT and Freud sharpen the bottom axis of the bit to a V-shape, and the rest leave the area flat or unsharpened, as shown in the photo *below left*. We found that the carbide-tooth design and the V-bottoms produced smoother plunging action, although the quality of cut stayed the same for all the bits.

On core-box bits look for a cleanly ground point on the bottom tip of the bit. The bits with steeper angles plunge smoothly and leave a cleaner cut.




**Woodtek offers a tooth on bottom. CMT sharpens a ridge between the cutters. Sears leaves this area flat.**




**CMT grinds an extra relief angle on its core-box bit. Freud's bit comes to a more distinct point than Carb-Tech's.**

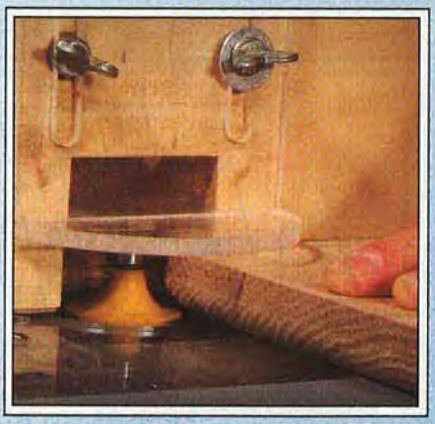
## 6. (For bits with bearings) Is there a relief angle ground under the bearing?

On bits with bearings, some manufacturers grind a relief angle on that portion of the carbide that hides under the bearing, as in the photo at *near right*. With the bearing in place, this edge will never see any cutting action. But if you want to change to a smaller bearing to change the profile of the bit, you must have the relief grind under the bearing. Otherwise, the unrelieved carbide will burn when you switch to the smaller bearing.

**The Bosch bit, left, offers a dust shield and a relief grind under the bearing. The Grizzly bit, right, typical of the Taiwanese bits tested, keeps costs low by offering neither.**

## 7. Does a colored coating make a router bit better?

Several manufacturers add a colored coating to the bodies of the bits. These bright colors show up clearly in use and add an extra margin of safety to your routing. Many of the coatings also help keep pitch and resin off the bit. CMT's patented orange Teflon coating makes its bits easier to clean. Oldham also coats its bits with an anti-stick coating. On Porter-Cable's bits, a black-oxide coating prevents rust. Freud paints its bits red. This paint doesn't offer any anti-stick properties, and the paint tends to deteriorate near the carbide where the most heat is generated.



**A bit with a brightly colored coating shows up much better than an ordinary bit and serves as a reminder to keep your fingers away.**

## 8. Are thicker carbide cutters better than thin?

If you have your router bits resharpened frequently, look for thick carbide cutters. You can resharpen router bits with a lot of carbide 10 to 12 times, but you may only get 4 to 5 resharpenings out of the thinner carbide cutters. We found a wide variety of carbide thicknesses within every manufacturer's line, so we suggest you compare the same bits from different manufacturers side by side to see which bits offer the most carbide. Also see the comparison of carbide thickness in our chart on *page 46*.

## 9. How can I tell if a bit will burn the wood?

Any router bit will burn wood if it's left in one place long enough. But in normal operation, none of the new bits we tested left burn marks. Burning usually won't occur until the cutting edge of the carbide loses its factory sharpness.

The type of wood you are working and the feed rate also play a roll in burning. If you've had a problem with burning in the past, especially with woods such as maple or cherry, we suggest you choose from the router bits that we rated excellent in the edge-quality column in the chart.

## 10. Which bits are right for me?

Buy higher-quality bits if you use your router often, machine hard or highly figured woods, or rout difficult-to-sand profiles. Good bits also make sense for frequently-used profiles like round-overs.

You can, however, save money by choosing the lower-cost bits if you only use your router occasionally, or if you're a beginning woodworker and want to acquire a lot of tools on a limited budget. It's also a smart idea to choose a lower-cost bit for special projects where you need a profile that you may only use once.

## Our recommendations

We found that the bits fell into three categories with CMT and Freud at the top. The sharpening and finishing quality of these bits set them apart from the competition. Even after our tests, when every other bit showed (under 30X magnification) some edge deterioration, CMT's edges looked brand new, and Freud's edges showed only a fraction of the wear we saw on all the rest. In our overall ratings we gave CMT a slight edge over Freud, mostly for the little details like the extra relief grind on the tip of the core-box bit, thicker carbide, and a more-durable coating.

The next category includes Amana, Bosch, DeWalt, DML, Eagle America, Oldham, Porter-Cable, Sears Industrial, Vermont American Industrial, and Whiteside. These gave us excellent results as well. As a group, they don't exhibit all the extra refinements we found in CMT and Freud. But the consistent high quality in the manufacturing of these bits ensure that they will withstand many years of hard use in any home or professional shop.

Our third group of bits—CarbTech, Cascade, Enlon, Grizzly, MLCS, and Woodtek—come from Taiwan and offer excellent value for the money. Our visual inspection of the carbide edges showed the sharpening quality in the fair-to-good range. Even so, these bits cut just about as well as the best bits in the test. Over time, however, these bits will dull sooner, and as a result may tend to burn a little quicker than those with better sharpening quality.

On some Taiwanese bits we also noted a lack of concentricity. This means that one cutter measures slightly larger than its opposite, thus causing the larger cutter to dull sooner. You can usually spot this defect immediately—you'll feel some chatter or see scalloping on the workpiece. Since this was an infrequent problem, you can eliminate the risk and get a bargain with these bits by ordering from a company with a good return policy.

*Continued*

# CARBIDE ROUTER BITS

## RATING CARBIDE ROUTER BITS

| COMPANY AND BIT NUMBER | | BIT TYPE (1) | CHIPPING | | | FUZZING | | | CONTROL | | CARBIDE EDGE QUALITY (2) | | CARBIDE THICKNESS (3) | OVERALL RATING (4) | COUNTRY OF ORIGIN (5) | PRICE RANGE (6) | SUGGESTED RETAIL PRICE (7) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | OAK | PINE | PLYWOOD | OAK | PINE | PLYWOOD | FEED RATE | VIBRATION, CHATTER | SHARPENING QUALITY | EDGE QUALITY AFTER TEST | | | | | | |
| AMANA | 45910 | CB | E | E | E | G | E | G | E | E | E | E | E | 9.7 | I | H | $ 24 | No-frills bits with excellent overall quality and performance. |
| | 45224 | S | E | E | E | E | E | E | E | E | E | E | E | | | | 14 | |
| | 49518 | RO | E | E | -- | E | E | -- | E | E | E | E | E | | | | 35 | |
| | 54117 | P - 3⅜ | E | E | -- | G | G | -- | F | G | E | E | -- | | | | 135 | |
| BOSCH | 85446M | CB | E | E | E | F | G | G | E | E | E | G | G | 9.6 | U | H | 24 | Overall good to excellent quality. |
| | 85680M | S | E | E | E | E | E | E | E | G | E | G | E | | | | 15 | |
| | 85595M | RO | E | E | -- | E | E | -- | E | E | E | G | G | | | | 37 | |
| | 85639M | P - 3½ | E | E | -- | G | G | -- | G | G | E | G | -- | | | | 95 | |
| CARB-TECH | CT1032 | CB | E | E | F | F | G | F | E | E | G | F | G | 7.8 | T | M | 9* | A carbide tooth on the bottom of the straight bit gave smooth plunge cuts. Good value for the money. |
| | CT1008 | S | E | E | G | G | G | G | E | E | G | F | G | | | | 6* | |
| | CT1074 | RO | E | E | -- | E | G | -- | E | E | G | F | G | | | | 18* | |
| | AY44 | P - 3⅞ | E | E | -- | G | G | -- | F | G | G | F | -- | | | | 60* | |
| CASCADE | C1231 | CB | E | E | E | F | G | G | E | G | F | F | G | 7.8 | T | L | 11* | Bits come in a convenient plastic case that protects carbide edges. Good value for the money. |
| | C1004 | S | G | G | F | P | G | F | G | G | F | F | G | | | | 8* | |
| | C1187 | RO | E | E | -- | E | E | -- | E | E | F | F | G | | | | 15* | |
| | C1400 | P - 2⅝ | E | E | -- | F | F | -- | F | F | F | F | -- | | | | 30* | |
| CMT | 814-127 | CB | E | E | E | G | E | E | E | E | E | E | E | 10 | IT | H | 26* | Attention to detail resulted in flawless performance, even after heavy use. Anti-kickback profiles on larger bits. |
| | 812-127 | S | E | E | E | E | E | E | E | E | E | E | E | | | | 17* | |
| | 838-880 | RO | E | E | -- | E | E | -- | E | E | E | E | E | | | | 38* | |
| | 890-502 | P - 3¼ | E | E | -- | E | E | -- | E | E | E | E | -- | | | | 82* | |
| DeWALT | DW6604 | CB | E | E | E | F | G | G | E | E | F | F | F | 8.5 | I | H | 25 | Limited number of raised-panel bits, carbide sharpening only fair. Otherwise, good overall quality. |
| | DW6120 | S | E | E | E | E | E | E | E | G | F | F | G | | | | 23 | |
| | DW6522 | RO | E | E | -- | E | E | -- | G | G | F | F | G | | | | 37 | |
| | DW6592 | P - 2⅝ | E | E | -- | F | F | -- | F | F | F | F | -- | | | | 82 | |
| DML | 01129 | CB | E | E | E | G | G | G | E | E | E | G | G | 9.5 | U | H | 22 | Thin carbide on straight bit, but otherwise excellent quality. |
| | 00209 | S | E | E | E | E | E | E | E | E | E | G | G | | | | 14 | |
| | 01334 | RO | E | E | -- | E | G | -- | E | E | E | G | G | | | | 35 | |
| | 02058 | P - 3½ | E | E | -- | G | G | -- | G | F | E | G | -- | | | | 109 | |
| EAGLE AMERICA | 130-0802 | CB | E | E | E | F | G | G | E | E | G | G | E | 9.5 | U | MH | 18* | Three-wing panel raiser lacks shear angle which makes cutting difficult and slow. Otherwise, good to excellent quality and value. |
| | 102-0832 | S | E | E | E | E | E | E | E | E | G | G | E | | | | 13* | |
| | 156-0805 | RO | E | E | -- | E | E | -- | E | E | G | G | E | | | | 26* | |
| | 186-5835 | P - 3⅜ | E | E | -- | E | E | -- | P | P | G | G | -- | | | | 85* | |
| ENLON | R038 | CB | E | E | G | F | G | G | E | E | F | F | E | 7.8 | T | L | 13* | Bits come in a convenient plastic case that protects carbide edges. Best prices in the test. |
| | R008 | S | E | E | F | G | G | G | G | G | F | F | G | | | | 6* | |
| | R024 | RO | E | E | -- | E | G | -- | E | E | F | F | G | | | | 16* | |
| | R066 | P - 1⁹⁄₁₆ | E | E | -- | G | G | -- | E | G | F | F | -- | | | | 21* | |

**NOTES:**

- E Excellent
- G Good
- F Fair
- P Poor
- -- Not applicable

1. (CB) Core box
   (S) Straight
   (RO) Round-over
   (P) Panel - Number indicates cutting diameter of bit.
   (*) Vertical design
2. As observed with a 30x magnifier.
3. No measurement taken on panel raising bits due to dissimilarities in bit size.
4. Scale of 1-10, with 10 as the best.
5. (I) Israel
   (IT) Italy
   (T) Taiwan
   (U) United States
6. Based on average of all four bits.
   (H) High
   (MH) Medium-high
   (M) Medium
   (L) Low
7. (*) Indicates catalog price.

# RATING CARBIDE ROUTER BITS

| COMPANY AND BIT NUMBER | | BIT TYPE (1) | CHIPPING | | | FUZZING | | | CONTROL | | CARBIDE EDGE QUALITY (2) | | | OVERALL RATING (4) | COUNTRY OF ORIGIN (5) | PRICE RANGE (6) | SUGGESTED RETAIL PRICE (7) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | OAK | PINE | PLYWOOD | OAK | PINE | PLYWOOD | FEED RATE | VIBRATION, CHATTER | SHARPENING QUALITY | EDGE QUALITY AFTER TEST | CARBIDE THICKNESS (3) | | | | | |
| FREUD | 18-108 | CB | E | E | E | G | E | E | E | E | E | E | E | 9.8 | IT | H | $ 24 | Excellent performance and edge quality. Anti-kickback profiles on larger bits. |
| | 04-130 | S | E | E | E | E | E | E | E | E | E | E | G | | | | 16 | |
| | 34-126 | RO | E | E | -- | E | E | -- | E | E | E | E | E | | | | 44 | |
| | 99-215 | P - 3½ | E | E | -- | G | E | -- | E | E | E | E | -- | | | | 109 | |
| GRIZZLY | G1683 | CB | E | E | G | F | G | G | E | E | F | F | G | 7.8 | T | L | 14* | Bits come in a durable plastic case that protects carbide edges. Good value for the money. |
| | G1668 | S | E | E | G | G | G | G | G | G | F | F | G | | | | 6* | |
| | G1422 | RO | E | E | -- | E | G | -- | E | E | F | F | G | | | | 19* | |
| | G2937 | P - 2⅝ | E | E | -- | G | G | -- | G | E | F | F | -- | | | | 30* | |
| MLCS | 417 | CB | E | E | G | F | G | F | G | G | F | F | G | 7.8 | T | M | 14* | Only Taiwanese source to offer a line of anti-kickback bits. Price includes shipping. Good value for the money. |
| | 474 | S | E | E | F | G | G | G | G | G | F | F | G | | | | 7* | |
| | 8655 | RO | E | E | -- | E | G | -- | E | E | F | F | G | | | | 24* | |
| | 686 | P - 3¼ | E | E | -- | F | F | -- | F | F | F | F | -- | | | | 45* | |
| OLDHAM | 140-4-RON | CB | E | E | E | E | E | E | P | F | F | F | G | 8.2 | U | H | 45 | Lack of relief on the bottom of the core-box bit caused it to walk up and out of the cut. Anti-kickback profiles on larger bits. |
| | 121-4-DFS | S | E | E | F | G | G | G | E | E | F | F | E | | | | 15 | |
| | 120-2-ROV | RO | E | E | -- | E | G | -- | E | E | F | F | G | | | | 34 | |
| | 250-2-RPSI | P - 2⅝ | E | E | -- | F | F | -- | E | G | F | F | -- | | | | 88 | |
| PORTER-CABLE | 43145 | CB | E | E | E | F | F | F | E | G | E | E | F | 9.6 | U | H | 22 | Core-box bit has no shear angle. This produces minor fuzzing, but prevents chipping on cross-grain routing. Anti-kickback profiles on larger bits. |
| | 43318 | S | E | E | E | E | E | E | E | E | E | E | E | | | | 14 | |
| | 43931 | RO | E | E | -- | E | G | -- | E | E | E | E | F | | | | 52 | |
| | 43527 | P - 3½ | E | E | -- | G | G | -- | E | E | E | E | -- | | | | 125 | |
| SEARS INDUSTRIAL | 25546 | CB | E | E | E | F | G | G | E | E | G | G | E | 9 | U | M | 14 | Vertical raised-panel bit fits in regular router table opening, but cuts with some difficulty. Otherwise, a good value for the money. |
| | 25827 | S | E | E | G | F | G | G | E | G | G | G | G | | | | 12 | |
| | 25538 | RO | E | E | -- | E | E | -- | E | E | G | G | G | | | | 28 | |
| | 25397 | P - 1⅝* | E | F | -- | G | G | -- | P | F | G | G | -- | | | | 40 | |
| VERMONT AMERICAN | 22722 | CB | E | E | G | F | G | G | E | E | G | F | E | 9.2 | U | MH | 17 | No dust sheld on the round-over bit, but good consistent high quality on all bits. |
| | 22446 | S | E | E | E | G | G | G | E | G | G | F | G | | | | 16 | |
| | 22829 | RO | E | E | -- | E | E | -- | E | E | G | F | G | | | | 47 | |
| | 22838 | P - 2⅝ | E | E | -- | G | G | -- | G | E | G | F | -- | | | | 58 | |
| WHITESIDE | 24B34 | CB | E | E | E | F | G | G | E | E | G | G | E | 9.5 | U | H | 23* | Three-wing panel raiser lacks shear angle which makes cutting difficult and slow. Otherwise, excellent quality and good value. |
| | 24A10 | S | E | E | E | E | E | E | E | E | E | E | E | | | | 15* | |
| | 24C25 | RO | E | E | -- | E | E | -- | E | E | G | G | E | | | | 31* | |
| | 24F37 | P - 3⅜ | E | E | -- | E | E | -- | P | P | G | G | -- | | | | 100* | |
| WOODTEK | 819-089 | CB | E | E | E | G | G | G | E | E | G | F | G | 8 | T | M | 11* | Bottom-cleaning carbide tooth on the straight bit gave super-smooth results. Overall good quality and prices. |
| | 818-788 | S | E | E | G | G | G | G | E | E | G | F | G | | | | 9* | |
| | 820-074 | RO | E | E | -- | E | G | -- | E | E | G | F | G | | | | 15* | |
| | 820-382 | P - 3⅜6 | E | E | -- | G | G | -- | E | E | G | F | -- | | | | 50* | |

**SOURCES:**

**AMANA TOOL CORP.**
800/445-0077

**BOSCH**
**S-B POWER TOOL CO.**
312/794-7597

**CARB-TECH (Trend-lines)**
800/767-9999

**CASCADE TOOLS, INC.**
800/235-0272

**CMT**
813/886-1819

**DeWALT INDUSTRIAL TOOL CO.**
800/433-9258

**DML**
800/242-7003

**EAGLE AMERICA CORP.**
800/872-2511

**ENLON IMPORT CORP.**
800/888-9697

**FREUD USA, INC.**
800/334-4107

**GRIZZLY IMPORTS**
206/647-0801

**MLCS**
800/533-9298

**OLDHAM UNITED STATES SAW**
800/828-9000

**PORTER-CABLE**
901/668-8600

**SEARS**
800/377-7414

**VERMONT AMERICAN**
704/735-7464

**WHITESIDE (Woodcraft)**
800/225-1153

**WOODTEK (Woodworker's Supply)**
800/645-9292

# SPOTLIGHT ON

**These woodshop workhorses won't kick back and have guards aplenty, but if you saw unprepared, it's still quite possible to stray into an accident.**

Believe it or not, every year over 7,000 accidents involving bandsaws occur in American workshops—three times the number reported for routers! Few of these mishaps result in hospitalization, though, according to national statistics compiled by the U.S. Consumer Products Safety Commission. That's probably because today's bandsaws have loads of safety features built in.

Nevertheless, what woodworker's heart hasn't skipped a beat or two operating one of these powerful sawing machines when the blade suddenly snapped? To help you maintain a regular heartbeat, we've gathered a bunch of sound safety advice from the *WOOD®* magazine staff as well as tool-industry experts.

## Set up for safety

Built-in safety guards on your bandsaw don't eliminate the need for shatterproof safety glasses, approved hearing protection, and even a dust mask if your stock produces fine dust particles. You'll also want to heed the following advice.

- Don't operate a bandsaw while wearing gloves, loose clothing (especially at the wrists), dangling jewelry, or long hair that could catch on moving parts.
- Keep a clean saw table and work area. Remove all tools, debris, and other objects not directly involved with sawing. Clear the floor space around the saw to prevent slipping.
- Install the correct-width blade for the work you intend to do (see the table, *above right*). To prevent blade overheating and binding, you should select the widest blade that will cut the smallest radius in the pattern you're sawing. Also, be sure the blade is the right length for your machine, or you won't be able to properly tension it. (Check your owner's manual for blade length and tensioning procedure).

Print this article

# BANDSAW SAFETY

**Bandsaw blade radius limits**

| *Blade Width (inches)* | *Min. Radius (inches)* |
|---|---|
| ¾ | 1¾ |
| ½ | 1½ |
| ⅜ | 1 |
| ¼ | ¾ |
| 3/16 | ½ |
| ⅛ | ¼ |

•Properly set the blade guard and guide before you begin sawing. For greater control and less chance of accidental contact with your fingers, you want as little as possible of the blade exposed above the wood you're sawing (see drawing *below*). About ¼" allows you to safely view the pattern line and maintain control of the workpiece. And don't forget to reset the blade guide if you change wood thicknesses.

•To prevent blade breakage and ensure a smooth cut, follow the steps to properly adjust the thrust bearing supporting the blade, as instructed in the owner's manual and explained, *below*.

•Be sure to securely close both the upper and lower wheel guards to retain the blade should it break during use.

•Carefully inspect the stock you want to saw for nails and foreign matter that can break a blade.

## Sawing with confidence

Now that you have adjusted the blade and set the guides, checked your stock, and otherwise prepared yourself, you're ready to saw. For an accident-free experience, follow these guidelines:

•Provide adequate viewing light on the cutline.

•Keep your hands to either side of the blade (never in line with it) when sawing. In straight-sawing, move the stock against the fence.

•Never run a bandsaw with a cracked blade. A clicking blade probably has a crack and should be replaced.

•Don't back the work away from the running blade if binding occurs. Instead, turn off the saw, allow the blade to stop, then back the workpiece out. To avoid binding, make relief cuts on tight-radius patterns (see *below*).

•If a blade breaks while you're sawing, immediately turn off the machine and wait for it to come to a complete stop. Then, untangle and remove the broken blade.

•Don't attempt to stop the bandsaw's motion after you have turned off power.

•Never attempt to remove scrap stock from the table while the saw blade is moving.

•Watch for thin, cutoff pieces that can jam in the saw-slot insert. These can deflect the blade off the cutting line or suddenly direct your fingers too close to the moving saw blade.

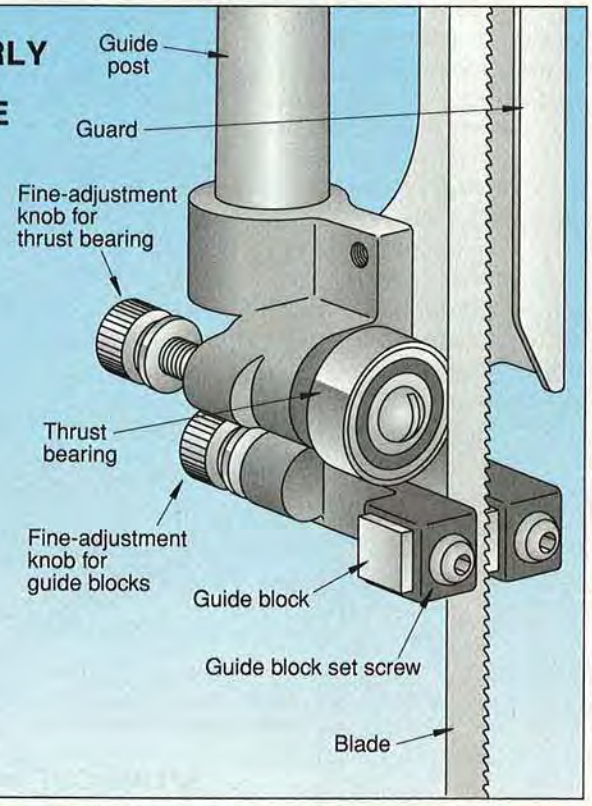
•Do not force material through the saw. This causes binding and unnecessary blade tension.

•Use a holding device for small or odd-shaped pieces. Add an auxiliary table to support oversized workpieces as you saw.

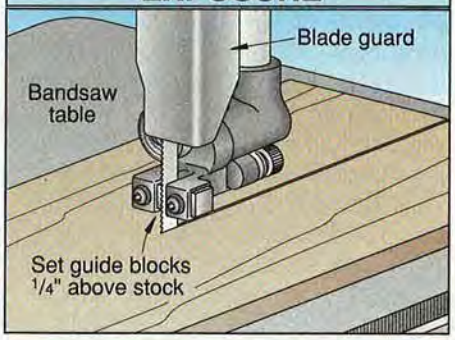
## HOW TO PROPERLY SUPPORT A BANDSAW BLADE

1. With the saw off, set the blade's tracking so that the bottoms of the gullets between teeth line up with the front of the guide blocks.

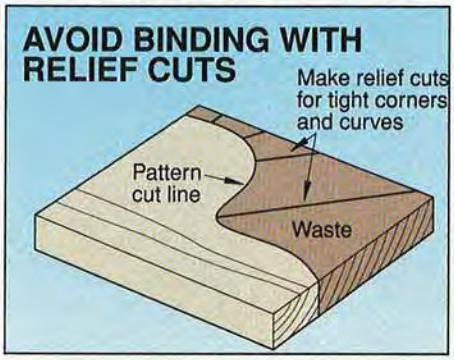
2. Turn on the saw, then slowly slide the thrust bearing to the back of the blade. When the blade turns the bearing, back off until it no longer rotates. Next, tighten the setting.




## ADJUST GUARDS FOR MINIMUM BLADE EXPOSURE



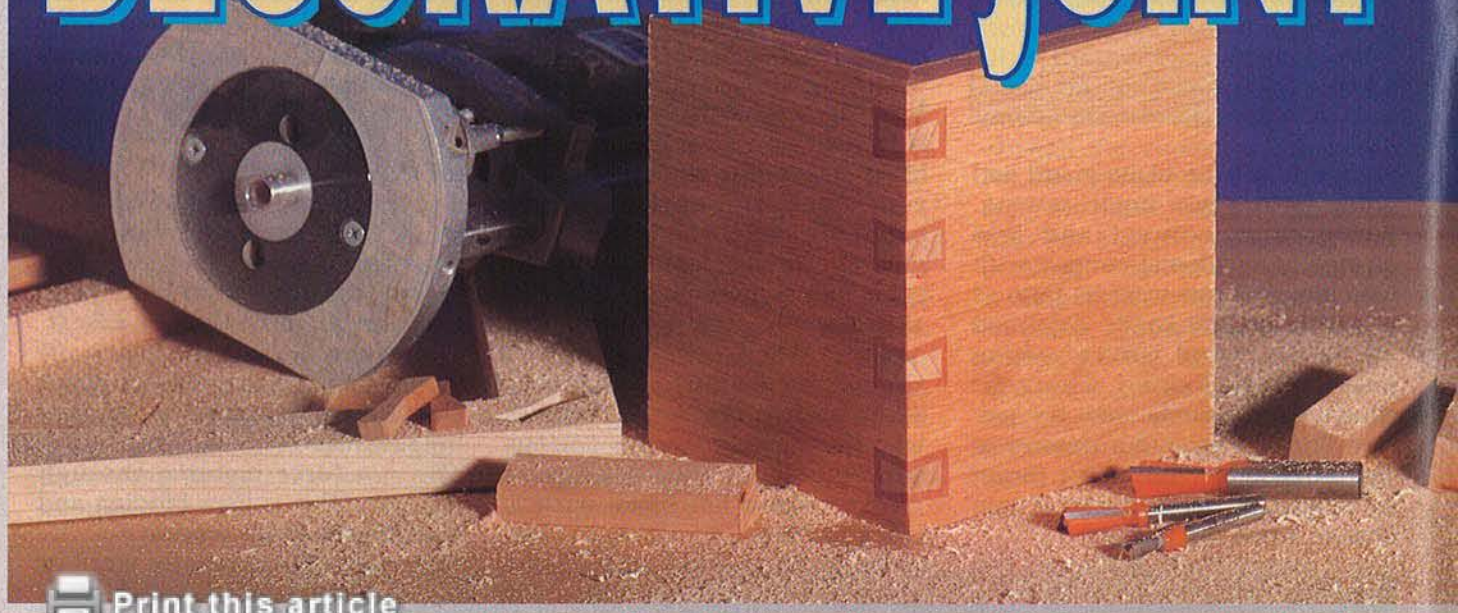

## AVOID BINDING WITH RELIEF CUTS




Written by Peter J. Stephano Photograph: John Hetherington Drawings: Kim Downing

STRENGTH AND GOOD LOOKS ROLLED INTO ONE

# DECORATIVE JOINT



Print this article

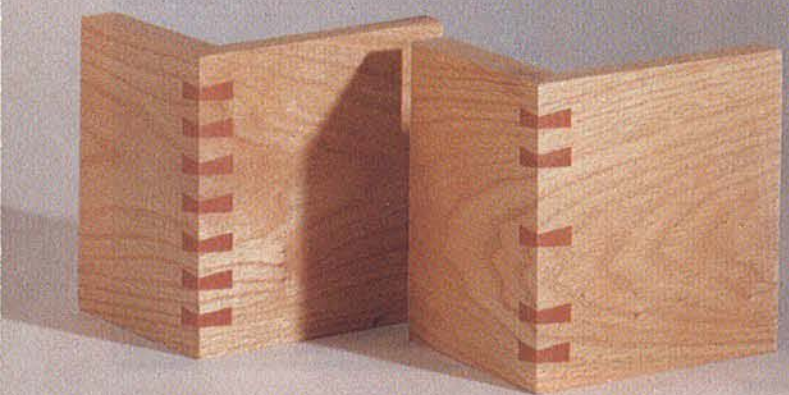
## CORNER KEYS UNLOCK THE BEAUTY IN YOUR MITERED BOXES

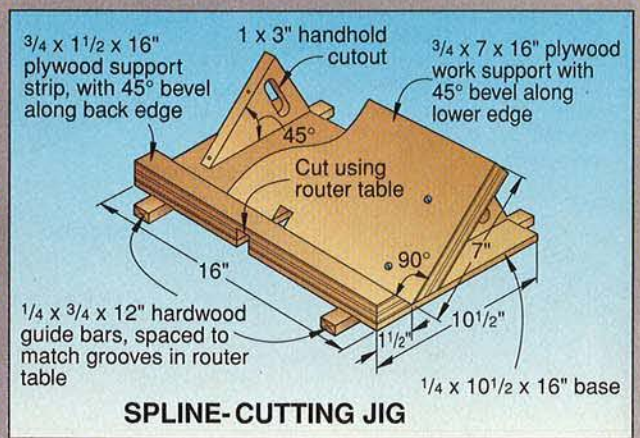
Although any of us can beam with pride over tight-fitting miters, these plain-looking joints rank low on the list of strongest joints. The good news is that you can beautify miters and make them much stronger in one fell swoop. The answer: *corner keys*. These consist of small pieces of wood in various shapes that fit tightly into slots (called *key ways*) cut diagonally through the miter joint. Viewed from either side of the joint, corner keys of different shapes give the appearance of dovetail, box, or finger joints. In this section we'll show you how to make a variety of corner keys useful for projects ranging from jewelry boxes to hope chests.

### First, you'll need a simple jig and a few router bits

To help you cut the key ways, you need to build the spline-cutting jig shown *below*. This handy device holds a mitered corner at a 45° angle as you pass the joint through a router bit. Building it requires only a few scraps of wood and about 10 minutes of your time. It should be at least twice as wide as your longest miter joint (our version handles miters up to 8" long).

Unless your router table already has twin miter-gauge slots, you'll need to add these for accepting the guide strips on the underside of the jig. We modified our router table by clamping a board of the necessary width to it and routing the slots as shown in *Photo 1*.

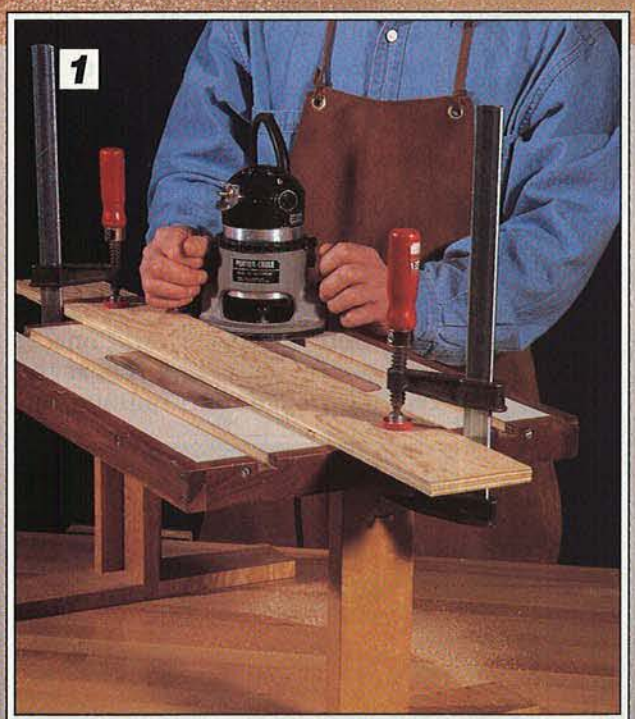



3/4 x 1 1/2 x 16" plywood support strip, with 45° bevel along back edge
1 x 3" handhold cutout
3/4 x 7 x 16" plywood work support with 45° bevel along lower edge
45°
Cut using router table
90°
7"
16"
1/4 x 3/4 x 12" hardwood guide bars, spaced to match grooves in router table
10 1/2"
1 1/2"
1/4 x 10 1/2 x 16" base

SPLINE-CUTTING JIG

# REINFORCEMENTS

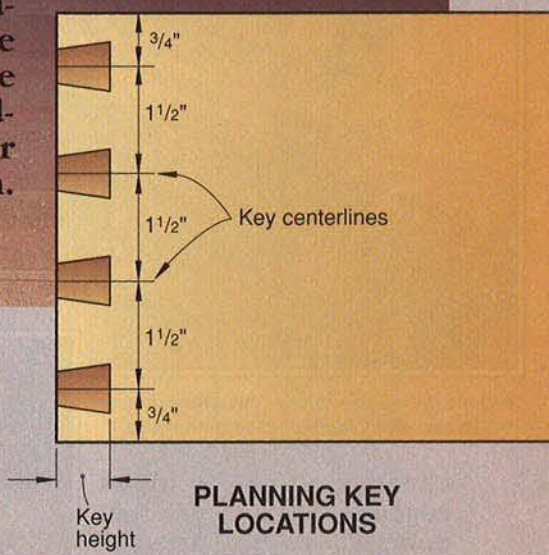
**If you're sitting there thinking, "Boy, those joints sure are great-looking; I wish I could do that," get ready for a happy surprise. Armed with the information we've developed for this article—and with a little practice—you can produce equally impressive results. So if you're ready to take your project-building skills to a new, higher level (and amaze your family and friends with your special talent), read on. We'll have you up and running in nothing flat.**




If your router table doesn't have two parallel slots, rout them for receiving the spline-cutting jig.

Make sure the board you use as the straightedge has two perfectly parallel edges. Cut the guide strips so they fit the slots snugly, and attach the strips after cutting the slots. Apply paraffin wax to the strips and slots so the jig glides smoothly.

As you can see from the examples shown on the *first four pages* of this article, you can make various keyed joints using dovetail, round nose, or straight router bits. The examples on the *following page* with keys within keys require two router bits, one about ¼" to ⅜" smaller in diameter than the other. If you decide to make a dovetail within a dovetail, the bits should have the same cutting angle. (Dovetail bits vary from 7° to 14° in cutting angle. We used 8° bits in ¾" and ⅜" diameters for the workpieces shown here.)



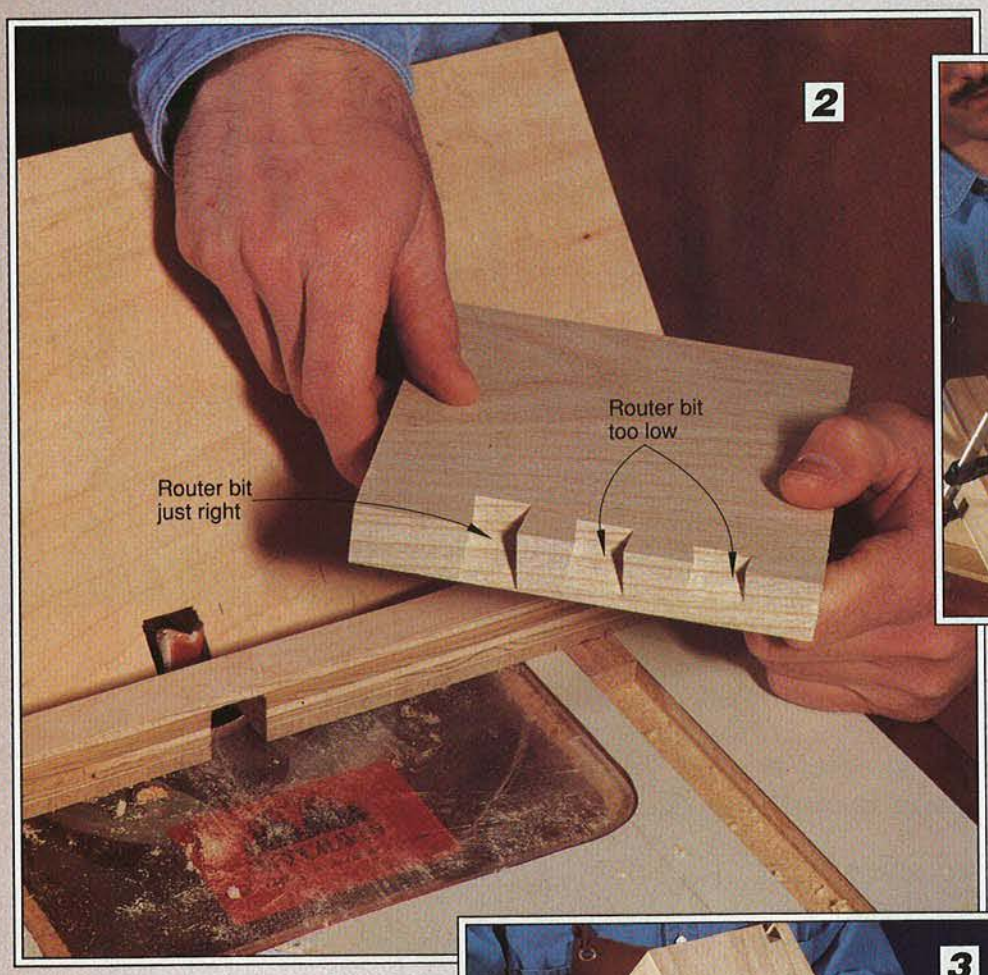

PLANNING KEY LOCATIONS

## Take a minute to do some simple planning

You can space the keys evenly or unevenly, but in either case you need to determine their center-to-center spacing as shown in the drawing *above*. The height of the keys should equal the thickness of your workpieces.

## Let's put the jig into action

Using the center-to-center spacings, cut blocks of wood in widths that match your spacings. For the example shown *above*, we cut three identical blocks, 1½" wide. (You don't need blocks for the edge-to-center spacings.) The blocks should be as thick as your workpieces and 4-6" long. Slightly




Adjust the router bit to cut through the thickness of the workpiece and no more.

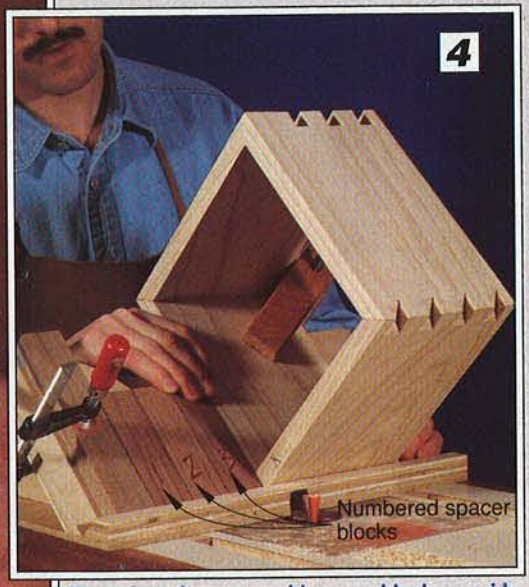
chamfer all of the block edges to help ensure that debris does not prevent them from solidly contacting each other. Number the blocks and set them aside.

Now, with a scrap piece of the same thickness as your workpieces, determine the correct router-bit height. Do this by making test cuts like those in *Photo 2*. The bit should cut across the full width of the edge, but no more.

Position a stopblock to make your first router cut of an end key.

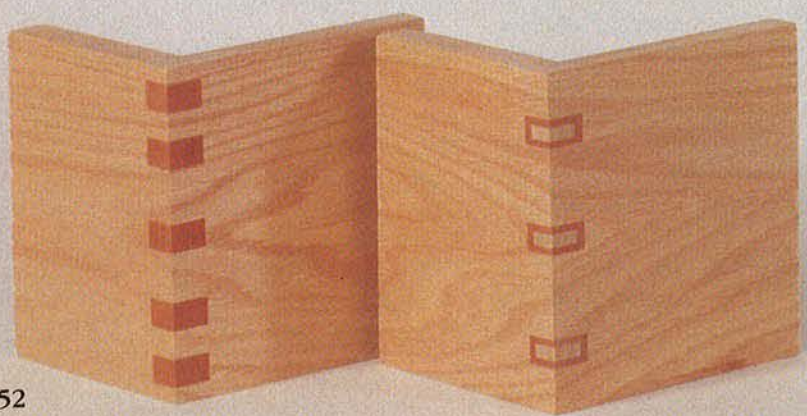
On your workpiece (a mitered box in this case), mark the center of either end key. Align this mark with the center of the router bit and clamp a stopblock onto the jig as shown in *Photo 3*. Measure the position of the cut, and readjust the stopblock if necessary. Mark an "X" on the end of your box that goes against the stopblock. Clamp your box to the jig.

After making the first cut, rotate the box to make the same cut in each mitered corner. Add one of the spacer blocks and repeat the cutting procedure. Continue this




To make other cuts, add spacer blocks as wide as the center-to-center spacing of your keys.

Use an adjustable triangle to accurately set the blade angle before ripping the key stock as shown. Complete this cut using a pushstick.



way until you cut slots for all of the keys as shown in *Photo 4*.

## How to make your keys

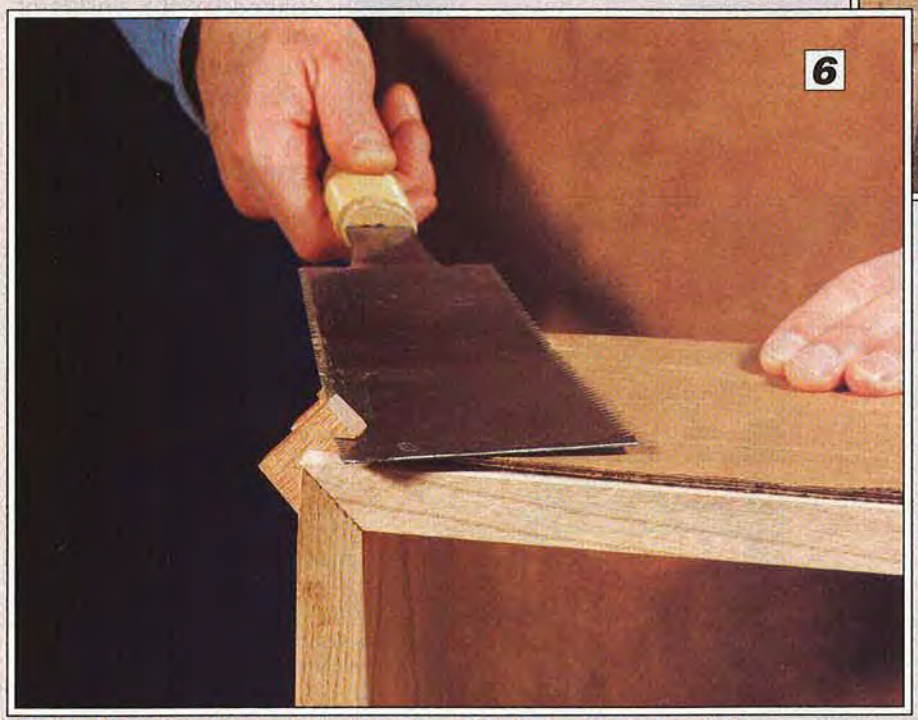
It's simple to make keys for box and finger joints. Just cut rectangular pieces of a contrasting wood that fit snugly into the slots. However, dovetail and rounded-finger keys require extra effort. Here's some advice for each type:

•To make ***dovetail keys,*** use an adjustable triangle to set your tablesaw blade to the same angle as the router bit's cutting edge. Rip one edge of your key stock at this angle, then readjust the fence and cut the tapered key as shown in *Photo 5*.

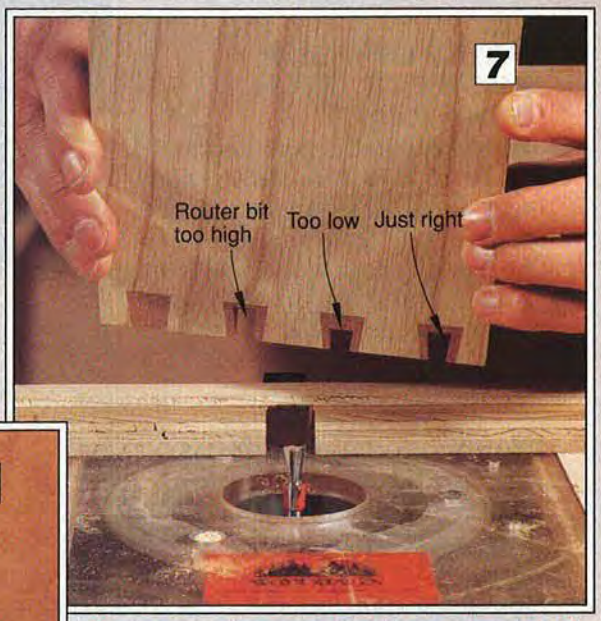
•Like finger and box keys, ***rounded-finger keys*** require that you cut rectangular pieces of wood that exactly fit the slots. Then, you round over both corners of one edge with a round-over bit. (Use a fence to make the second round-over cut.) The radius of the round-over bit should match the radius of the roundnose bit used to cut the slot.

## Install the keys

Cut the key stock to lengths just longer than the key slots, apply glue to the mating surfaces, and gently tap them into the slots. After the glue dries, saw off as much of the key stock as possible without marring the surrounding surfaces. We used a protective piece of cardboard and a Japanese-style handsaw with teeth that have little set as shown in *Photo 6*. Other saws will work, just be careful not to damage the surrounding wood surfaces. Finally, remove the remaining excess key stock with a stationary belt sander.



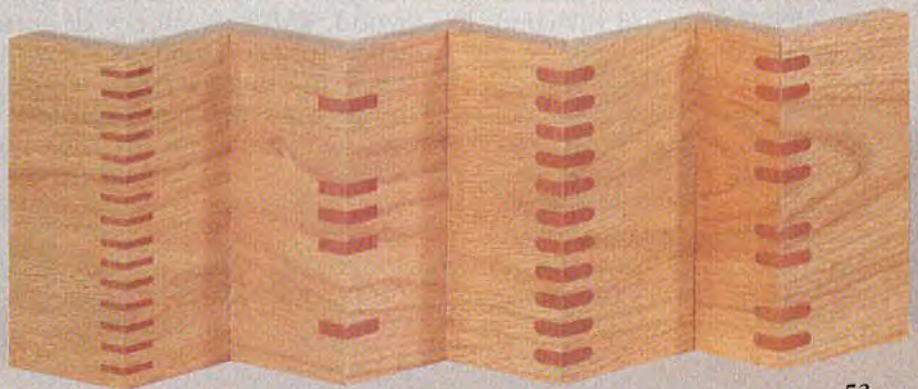

A piece of cardboard protects workpieces as you cut away excess key stock.




Working with scrap stock, adjust the height of the cut for the second key as shown here.

### How to make key-within-key reinforcements

It's easy to place one key within another. First, you install keys in all of the corners of your project as already described. Then, you make an extra corner from scrapwood that also has the first keys already in place. Next, you install a smaller router bit and adjust its height by making test cuts in the scrap piece as shown in *Photo 7*. Cut the slots by using the same stopblock and spacer blocks in the same order used to cut the larger key slots. Once you're satisfied with the results, repeat the steps for the second dovetail cuts in your actual project.

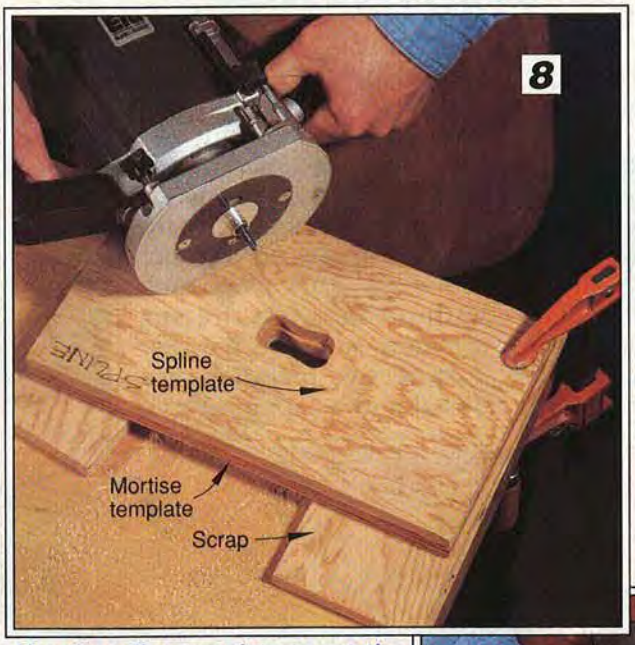


## DRESS UP YOUR PROJECTS WITH BOW TIES

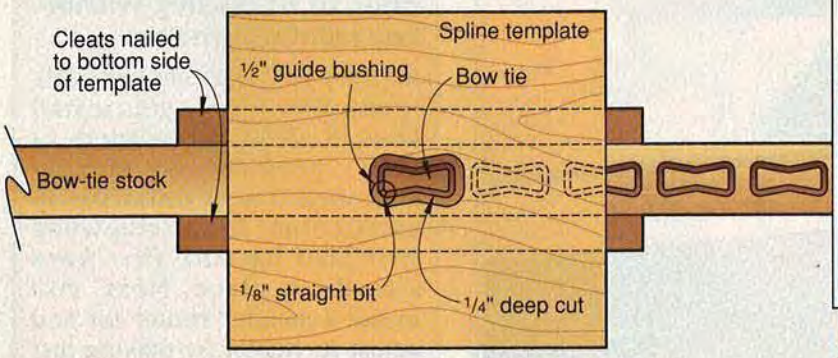
Like keys, surface splines in the shape of bow ties add strength and good looks to butted surfaces. You can add them to mitered frame corners or to panels such as the example *below*. Here, we'll show you how to add such a spline to a mitered frame corner.

### You'll need these items

We prefer to use a plunge router for this procedure, but any router will work. You'll also need a ½"-outside-diameter guide bushing for the base of your router, ¼"- and ⅛"-diameter straight bits, and two 8×10" pieces of ⅜" or ½" plywood.




Use the spline template to cut the mortise template.




CUTTING THE BOW TIES TO SHAPE

In addition, you'll need a pattern for cutting the spline template—we've provided three choices in *WOOD PATTERNS™*. The shaded portions of these patterns show the finished size of the bow tie.

### First, make your templates

Create the spline template from one of the pieces of plywood. In its center, cut a hole in the shape of one of the spline templates. A scrollsaw works best for this. Mark "spline" on this template.

To make the mortise template, mount a ½" O.D. guide bushing and ¼" straight bit into your router. Then, clamp the spline template, your other piece of plywood, and two pieces of scrap wood to your bench as shown in *Photo 8*. Using the spline template as a guide, cut completely through the mortise template. (The scrap keeps the bit away from your bench.)

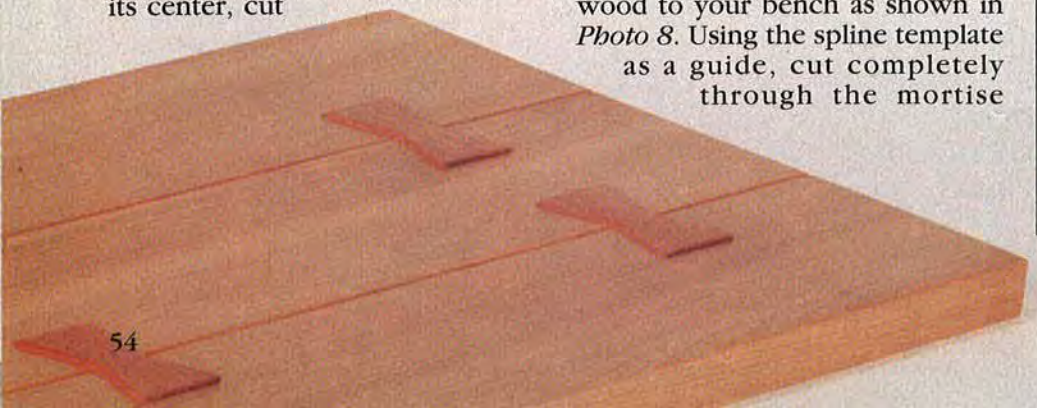
### Cut the bow ties

Replace the ¼" straight bit with an ⅛" straight bit. Then, nail two cleats of the same thickness as your bow-tie stock to the bottom side of the spline template, spaced by the width of the stock as shown in the drawing *left*.

Set the straight bit for a ¼"-deep cut, and clamp the spline template and bow-tie stock to your workbench as shown in *Photo 9*. Moving the router in a clockwise motion,

Keep the guide bushing firmly against the wall of the spline template to cut well-shaped bow ties.

Cut the ¼"-thick splines (bow ties) on the outboard side of your tablesaw blade.



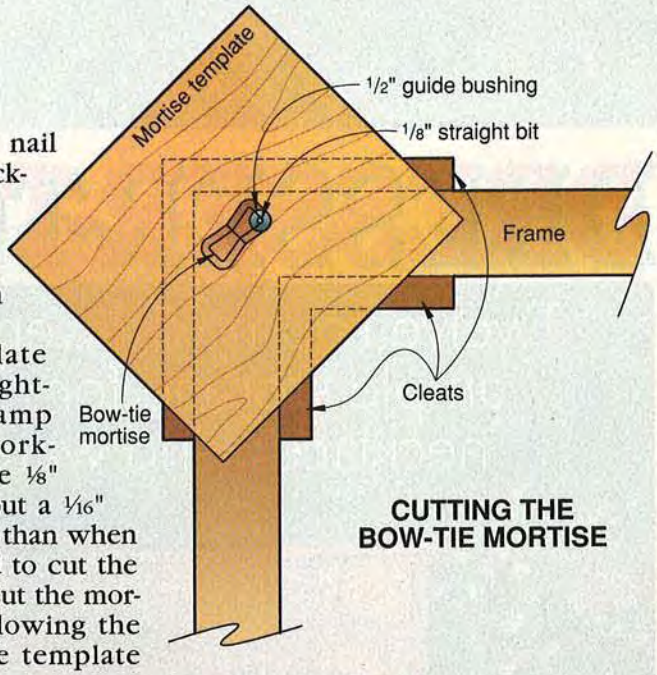
with the guide bushing against the spline-template wall, cut the bow ties to shape.

Adjust your tablesaw fence for cutting ¼"-thick bow ties on the outboard side of the blade (the side opposite the fence). Cut the splines as shown in *Photo 10*.

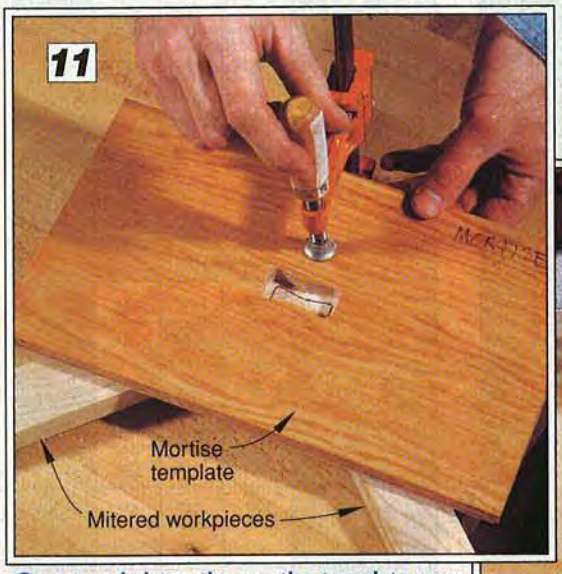
## How to install your splines

Visually center a bow tie on the joint of your project, and trace its outline with a pencil. Center this outline inside the hole in the mortise template, and clamp the template to the workpiece as shown in *Photo 11*. Turn this assembly upside down, and nail cleats the same thickness as the workpieces to the bottom of the template as shown in *Photo 12*.

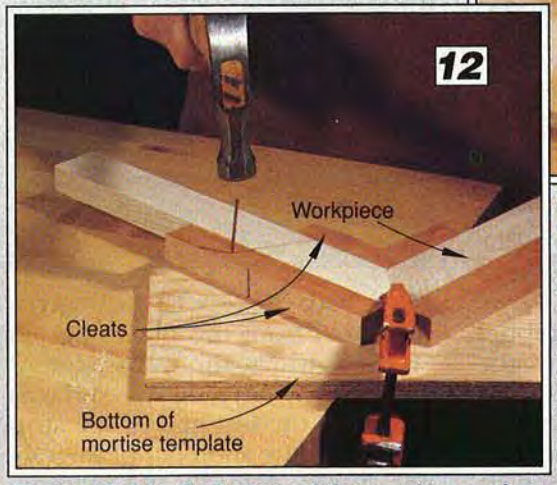
Turn the template and workpiece right-side up, and clamp these to your workbench. Adjust the ⅛" straight bit for about a 1/16" deeper cut than when it was used to cut the bow ties. Cut the mortise by following the wall of the template hole, and then hogging out the field material until the hole has a flat bottom. Remove the template. Glue the bow-tie spline into the mortise, allow the glue to dry, and sand the splines flush with the surface.



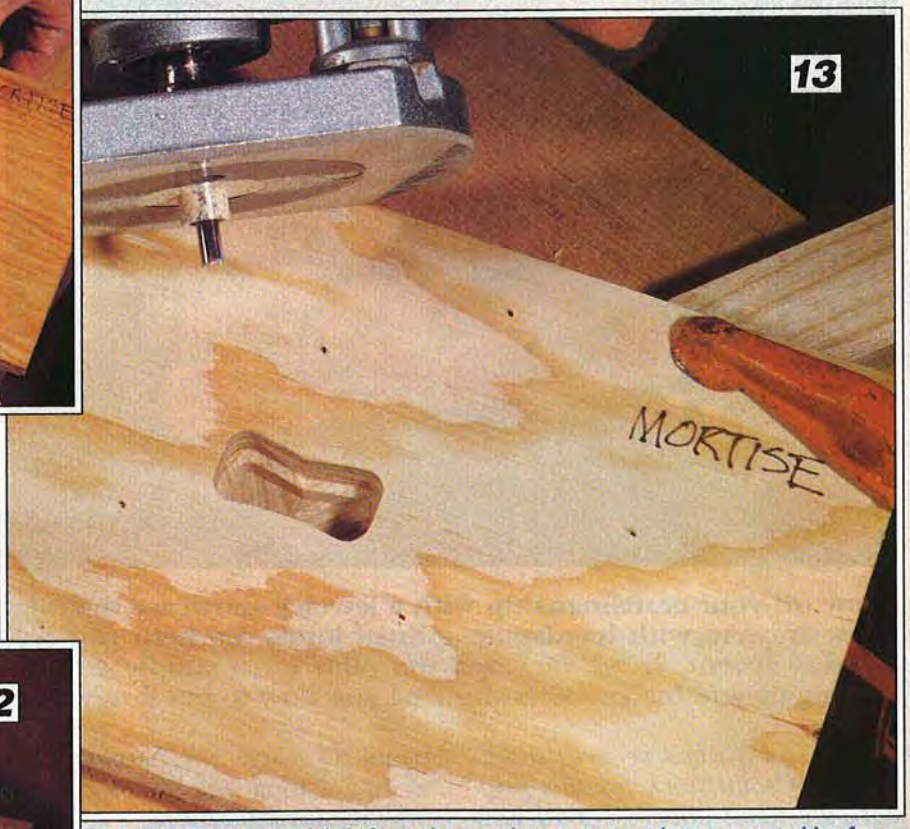

**CUTTING THE BOW-TIE MORTISE**




**Center and clamp the mortise template over the marked outline of the bow tie on your mitered workpiece.**



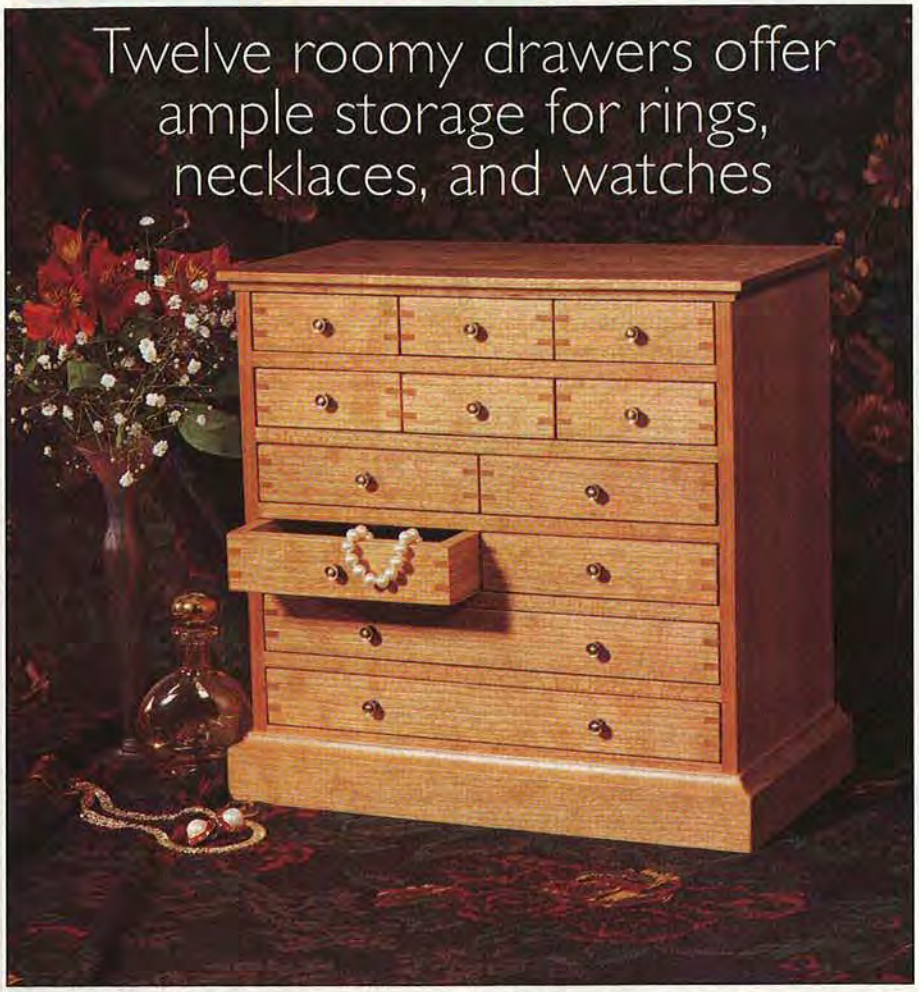

**Cleats nailed to the bottom of the mortise template hold the workpiece in position.**




**Occasionally vacuum debris from the mortise as you rout it to prevent chips from interfering with the cut.**

***Note:*** *In the case of the splines in the mission-style panel on the* opposite page, *we decided to leave the bow ties about 1/16" higher than the panel surface. So, we skipped sanding them down flush, and slightly chamfered their sharp corners instead.*

# DRESSER-TOP DELIGHT




**Show off your craftsmanship with a jewelry showcase that features drawers with handsome splined joints. To help you create this accent, we've included the plan for a simple corner-kerfing jig and instructions showing you how to put it to work.**

| Bill of Materials | | | | | |
|---|---|---|---|---|---|
| Part | Finished Size T | W | L | Matl. | Qty. |
| BASIC ASSEMBLY | | | | | |
| A* sides | ⅜" | 7½" | 13" | EC | 2 |
| B* top | ½" | 7⅞" | 13½" | EC | 1 |
| C shelves | ⅜" | 7⅜" | 12⅜" | EC | 6 |
| D bottom rail | ⅜" | 1⁹⁄₁₆" | 12" | C | 1 |
| E back | ⅛" | 12⅜" | 12¹³⁄₁₆" | BP | 1 |
| TRIM | | | | | |
| F* front | ½" | 1¾" | 13¾" | C | 1 |
| G* sides | ½" | 1¾" | 8" | C | 2 |
| DRAWERS | | | | | |
| H* fronts | ⅜" | 1⁷⁄₁₆" | 4" | C | 6 |
| I* fronts | ⅜" | 1⁷⁄₁₆" | 6" | C | 4 |
| J* fronts | ⅜" | 1⁷⁄₁₆" | 12" | C | 2 |
| K sides | ⅜" | 1⁷⁄₁₆" | 7⁵⁄₁₆" | C | 24 |
| L backs | ⅜" | 11" | 3⅝" | C | 6 |
| M backs | ⅜" | 11" | 5⅝" | C | 4 |
| N backs | ⅜" | 11" | 11⅝" | C | 2 |
| O bottoms | ⅛" | 3⅝" | 6⅛" | BP | 6 |
| P bottoms | ⅛" | 5⅝" | 6⅛" | BP | 4 |
| Q bottoms | ⅛" | 11⅝" | 6⅛" | BP | 2 |
| DRAWER GUIDES | | | | | |
| R top | ¼" | 3" | 7" | H | 6 |
| S middle | ¼" | 5" | 7" | H | 4 |
| T bottom | ¼" | 11" | 7" | H | 2 |

*Initially cut parts marked with an * oversized. Trim to finished size according to the instructions.

**Materials Key:** EC–edge-joined cherry, C–cherry, BP–birch plywood, H–hardboard.

**Supplies:** #17x¾" brads, #18x½" brads, clear finish.

*Note: You'll need several thicknesses of solid stock for this project (we used cherry). You can plane or resaw thicker stock to the thicknesses listed in the Bill of Materials, or see the Buying Guide for our source of preplaned cherry or walnut stock.*

## Cut the sides and top pieces first

**1** Cut the side panels (A) to 7⅞x13". Now, rip a strip ⅜" wide off the front edge of each side panel. Crosscut the narrow strip to 12¹³⁄₁₆" long. See the Side Panel drawing for reference.

**2** Lay out the locations, and cut ⅜" dadoes ³⁄₁₆" deep on the inside face of each side panel where dimensioned on the Side Panel drawing. Then, cut a ³⁄₁₆" rabbet ³⁄₁₆" deep along the top outside edge of each piece. Next, cut a ³⁄₁₆" rabbet ⅛" deep along the back inside edge of each side panel.

**3** To hide the dadoes showing on the front edges of each side panel, glue the ⅜x⅜x12¹³⁄₁₆" strip (trimmed from the front edge in Step 1) against the front edge of each panel, keeping the surfaces flush and the top end of the strip flush with the shoulder of the rabbet. Later, remove the clamps, and sand the panels.

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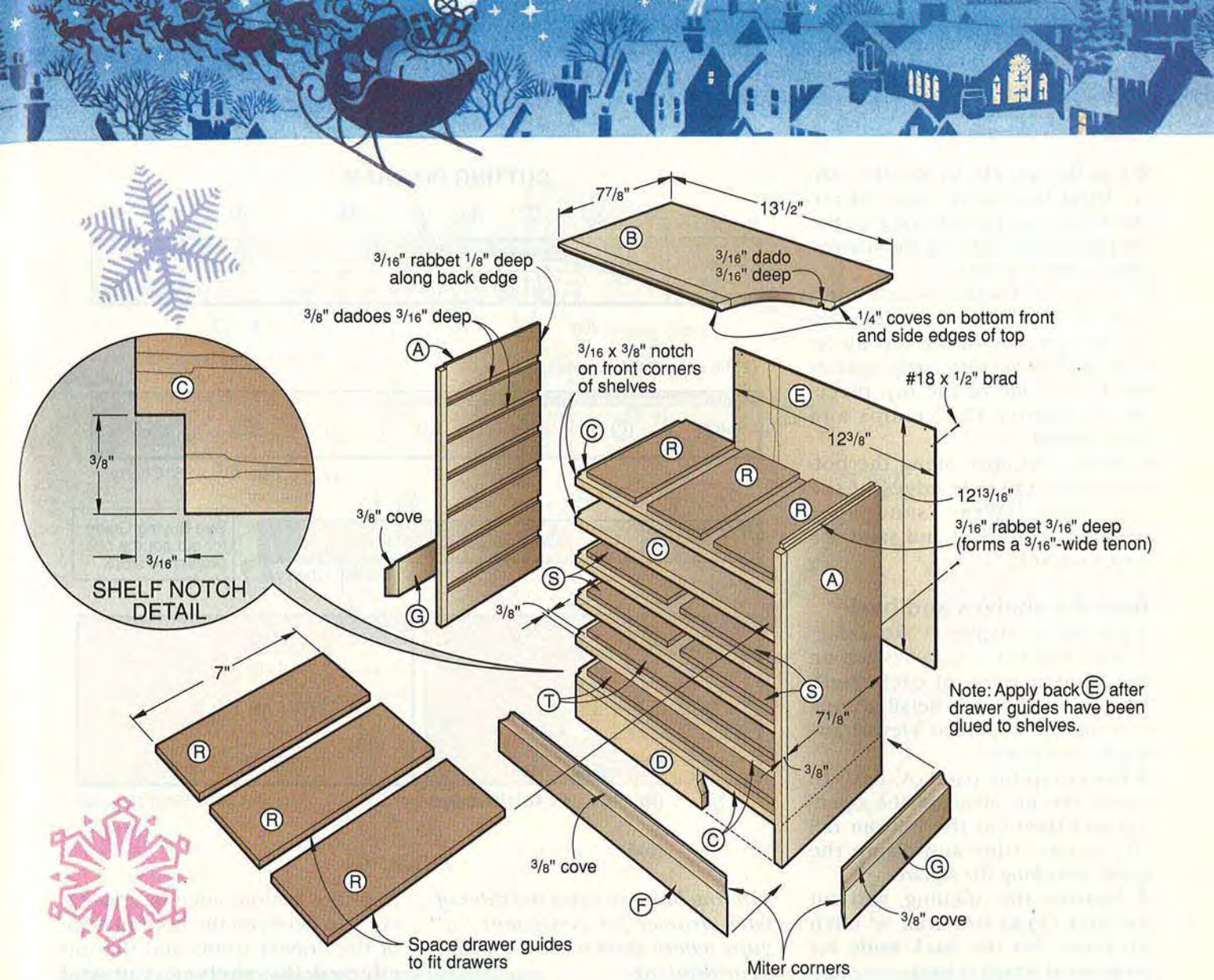
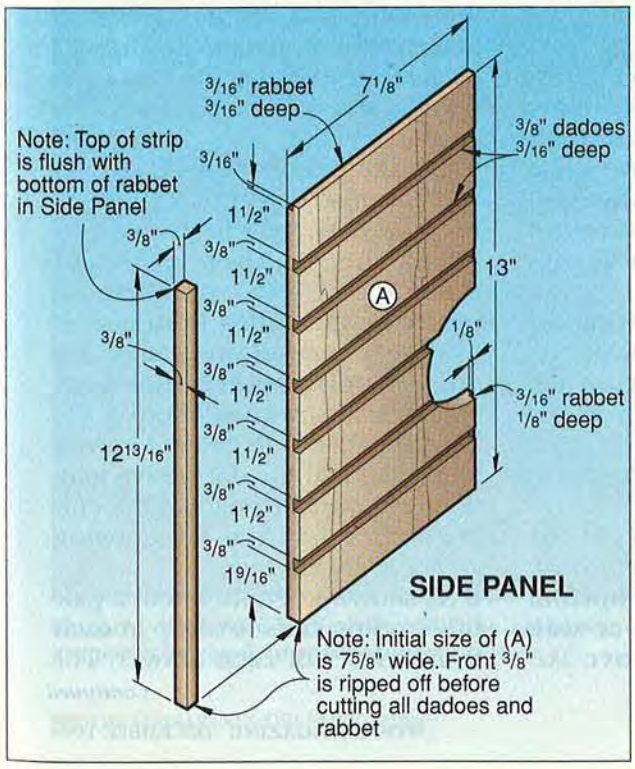
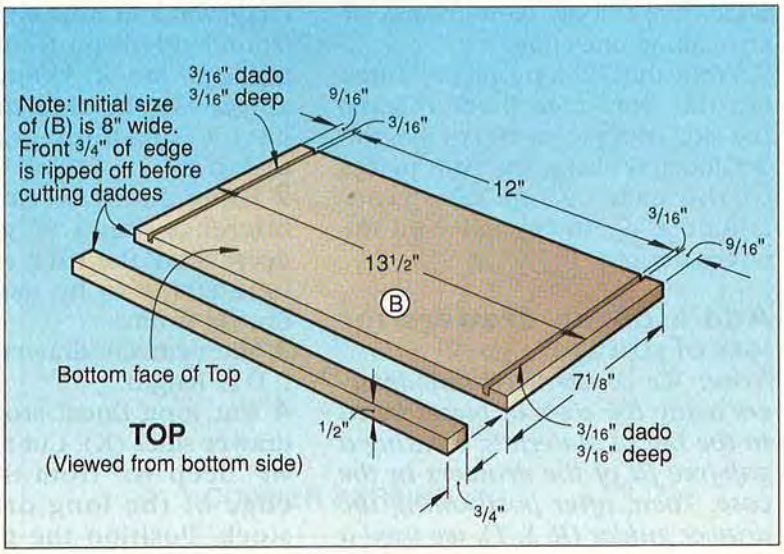



**EXPLODED VIEW**



**4** Cut the top (B) to 8×13½". Rip ¾" from the front edge where shown on the Top drawing on the *previous* page, and set the narrow piece aside for now.
**5** Mark the locations and cut a pair of 3/16" dadoes 3/16" deep on the bottom side of the top piece. Glue the ½×¾×13½" strip against the front edge of the top piece. Later, remove the clamps and sand smooth.
**6** Rout a ¼" cove along the bottom front and side edges of the top piece. Wrap sandpaper around a ½" dowel and sand the coves smooth.

## Add the shelves and back

**1** Cut the six shelves (C) to size.
**2** Mark and cut a 3/16×3/8" notch on the front corners of each shelf. See the Shelf Notch detail accompanying the Exploded View drawing for reference.
**3** Dry-clamp the parts (A, B, C) to check the fit. Measure the opening and then cut the bottom rail (D) to size. Glue and clamp the parts, checking for square.
**4** Measure the opening, and cut the back (E) to size from ⅛" birch plywood. Set the back aside for now, we'll attach it later.

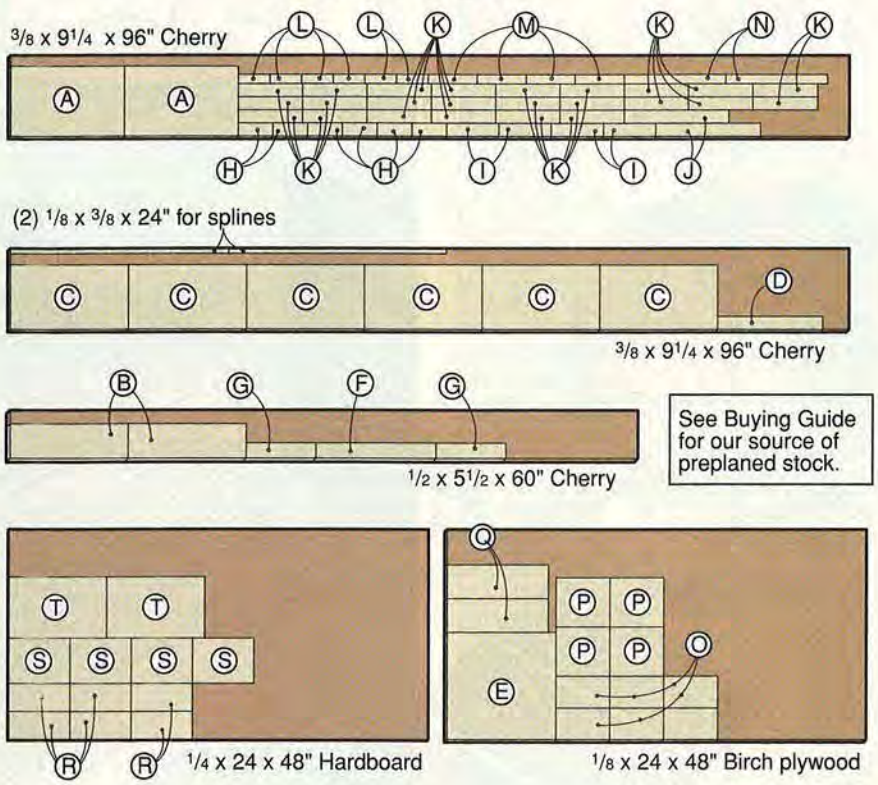
## Let's cut and attach the trim next

**1** Cut a ½" piece of cherry to 1¾" wide by 32" long. Now, rout a ⅜" cove along one edge.
**2** From the 32"-long piece, miter-cut the front trim piece (F) and the side trim pieces (G) to length.
**3** Glue and clamp the trim pieces to the case. Wrap sandpaper around a ¾" dowel and sand the coves smooth.

## Add a dozen drawers for lots of storage

***Note:*** *We constructed our drawers using the sizes of pieces listed in the Bill of Materials, creating a gap-free fit of the drawers in the case. Then, after positioning the drawer guides (R, S, T), we used a sanding block to sand the sides of each drawer for consistent 1/32" gaps where shown on the Front View drawing.*

**CUTTING DIAGRAM**


3/8 x 9 1/4 x 96" Cherry
A A
L L K M K N K
H K H I K I J
(2) 1/8 x 3/8 x 24" for splines
C C C C C C D
3/8 x 9 1/4 x 96" Cherry
B G F G
1/2 x 5 1/2 x 60" Cherry
See Buying Guide for our source of preplaned stock.
T T S S S S R R
1/4 x 24 x 48" Hardboard
Q P P P P O E
1/8 x 24 x 48" Birch plywood

**1** From ⅜"-thick stock, rip 1 7/16"-wide strips for the drawer fronts (H, I, J). As shown on the Cutting Diagram, cut adjoining drawer fronts end-to-end from the same piece of stock. Doing this will allow side-by-side drawers to have continuous grain across their fronts.
**2** Using the Drawer drawing for reference, cut a ⅛" groove 3/16" deep along the back edge of the long strips to be used for the drawer fronts.
**3** Miter-cut the drawer fronts (H, I, J) to length.
**4** Cut long lineal stock for the drawer sides (K). Cut a ⅛" groove 3/16" deep 7/32" from the bottom edge of the long drawer-side stock. Position the groove 7/32" from the bottom edge to create a 1/32" gap between the bottom edge of the drawer fronts and the top edge of the shelves. Cut and miter-cut the drawer sides to length. For housing the drawer backs later, cut a ⅜" dado in each drawer side where dimensioned on the drawing.
**5** Cut the drawer backs (L, M, N) and bottoms (O, P, Q) to size.
**6** Dry-clamp each drawer to check the fit. Then, glue and clamp each drawer, checking for square by measuring from corner to corner and adjusting until the opposing diagonal measurements are equal as shown in Photo A.
**7** To reinforce the mitered corner joints and add the decorative joinery look, start by building the corner-kerfing jig from the drawing on the *opposite* page.
**8** As shown in Photo B, cut a pair of ⅛" spline kerfs ¼" deep in each front corner of each drawer. For

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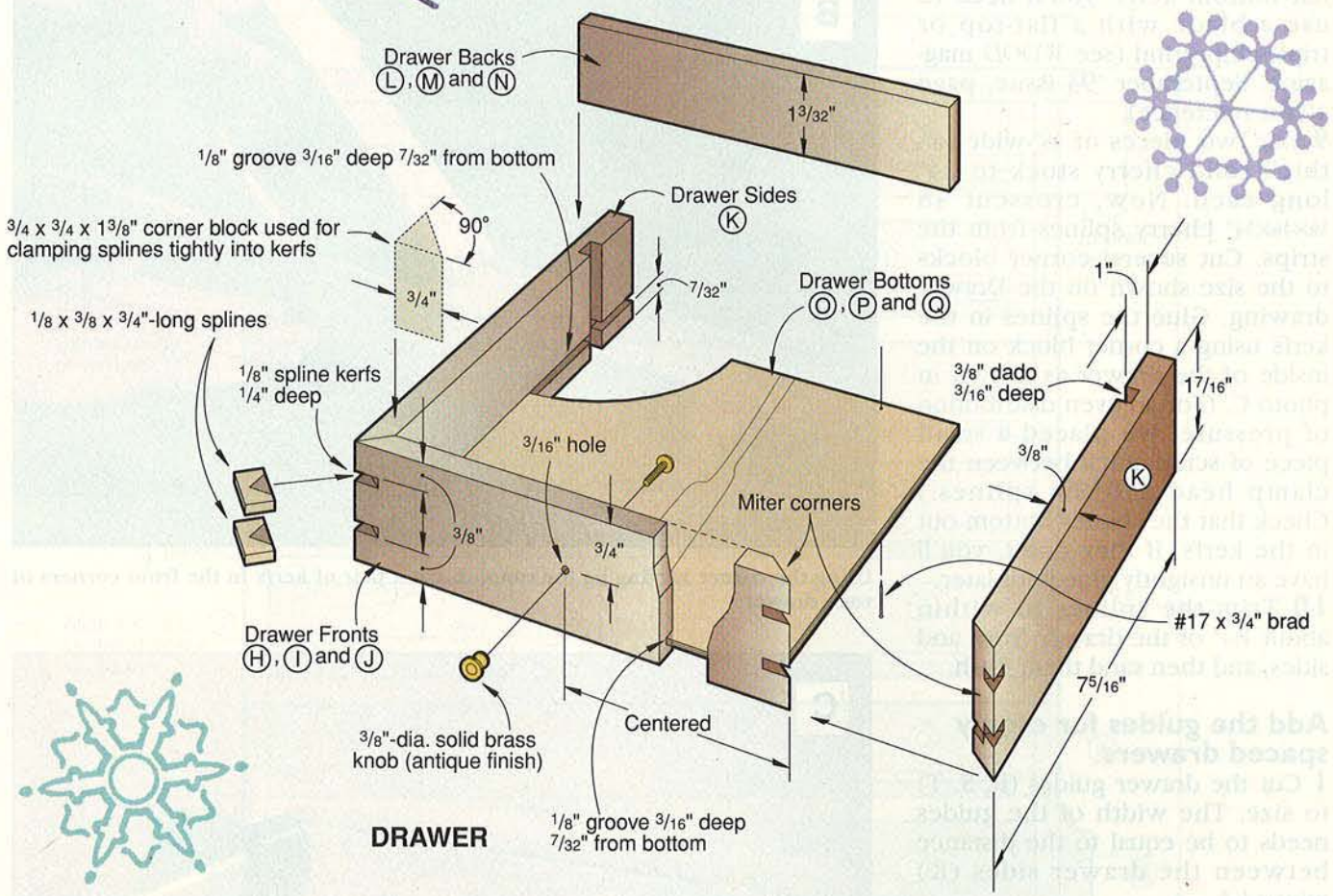
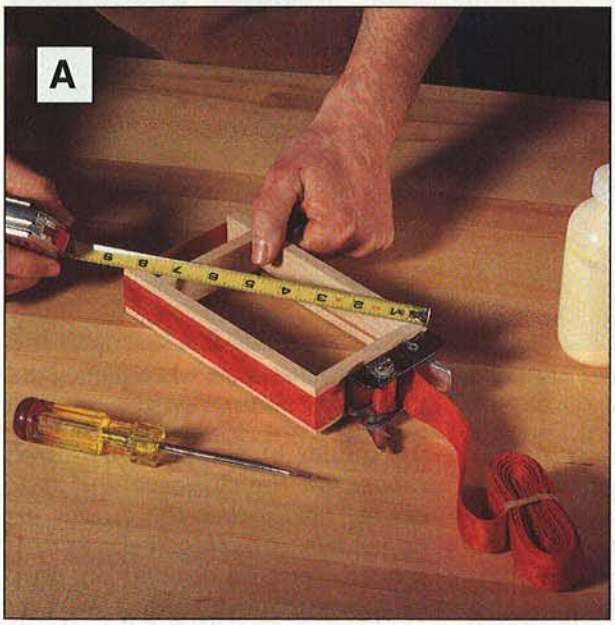
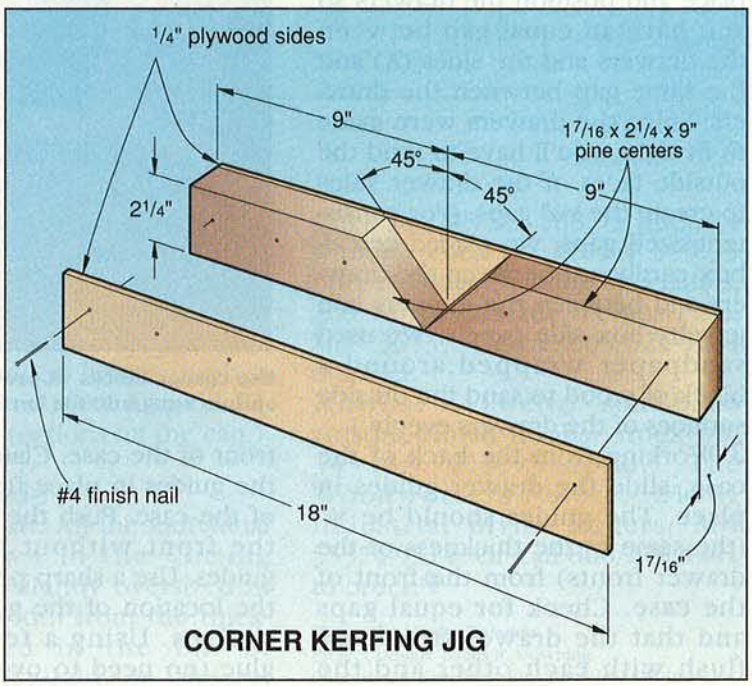



Measure diagonally and adjust until the measurements are perfectly equal, to ensure square drawers.



flat bottom kerfs, you'll need to use a blade with a flat-top or triple-chip grind (see *WOOD* magazine, September '93 issue, page 40 for reference).

**9** Cut two pieces of ⅜"-wide ⅛"-thick solid cherry stock to 24" long each. Now, crosscut 48 ⅛×⅜×¾" cherry splines from the strips. Cut several corner blocks to the size shown on the Drawer drawing. Glue the splines in the kerfs using a corner block on the inside of the drawer as shown in photo C. (For an even distribution of pressure, we placed a small piece of scrap stock between the clamp head and the splines.) Check that the splines bottom out in the kerfs. If they don't, you'll have an unsightly glue joint later.

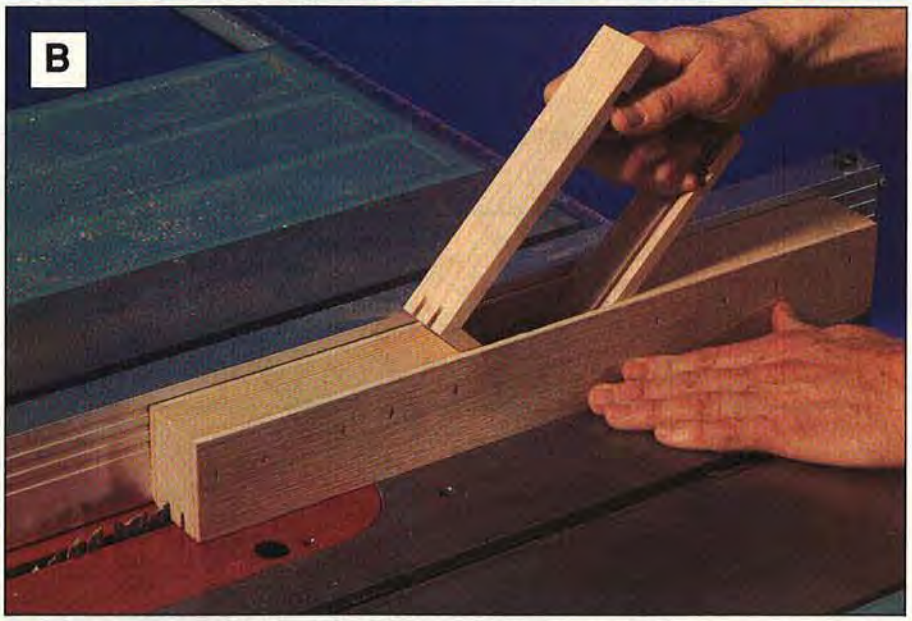
**10** Trim the splines to within about 1/16" of the drawer front and sides, and then sand them flush.

## Add the guides for evenly spaced drawers

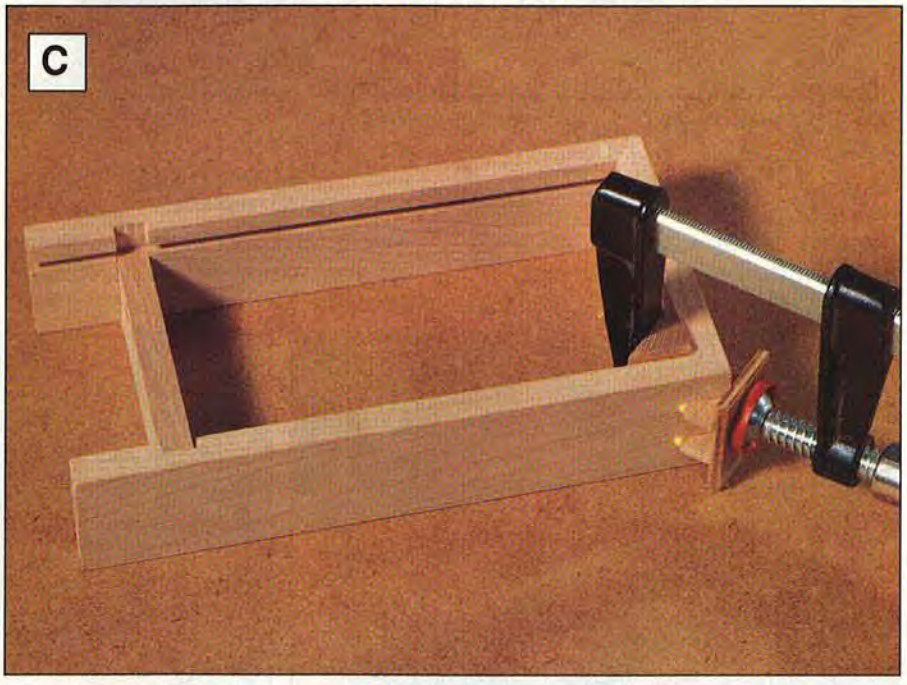
**1** Cut the drawer guides (R, S, T) to size. The width of the guides needs to be equal to the distance between the drawer sides (K) minus ½".

**2** Slide the top three drawers into place and position the drawers so you have an equal gap between the drawers and the sides (A) and the same gap between the drawers. Since the drawers were made to fit tight, you'll have to sand the outside faces of the drawer sides to create the ½" gaps. (For consistent-sized gaps, we placed cereal-box cardboard between the drawers and between the drawers and jewelry box side panels. We used sandpaper wrapped around a block of wood to sand the outside surfaces of the drawers evenly.)

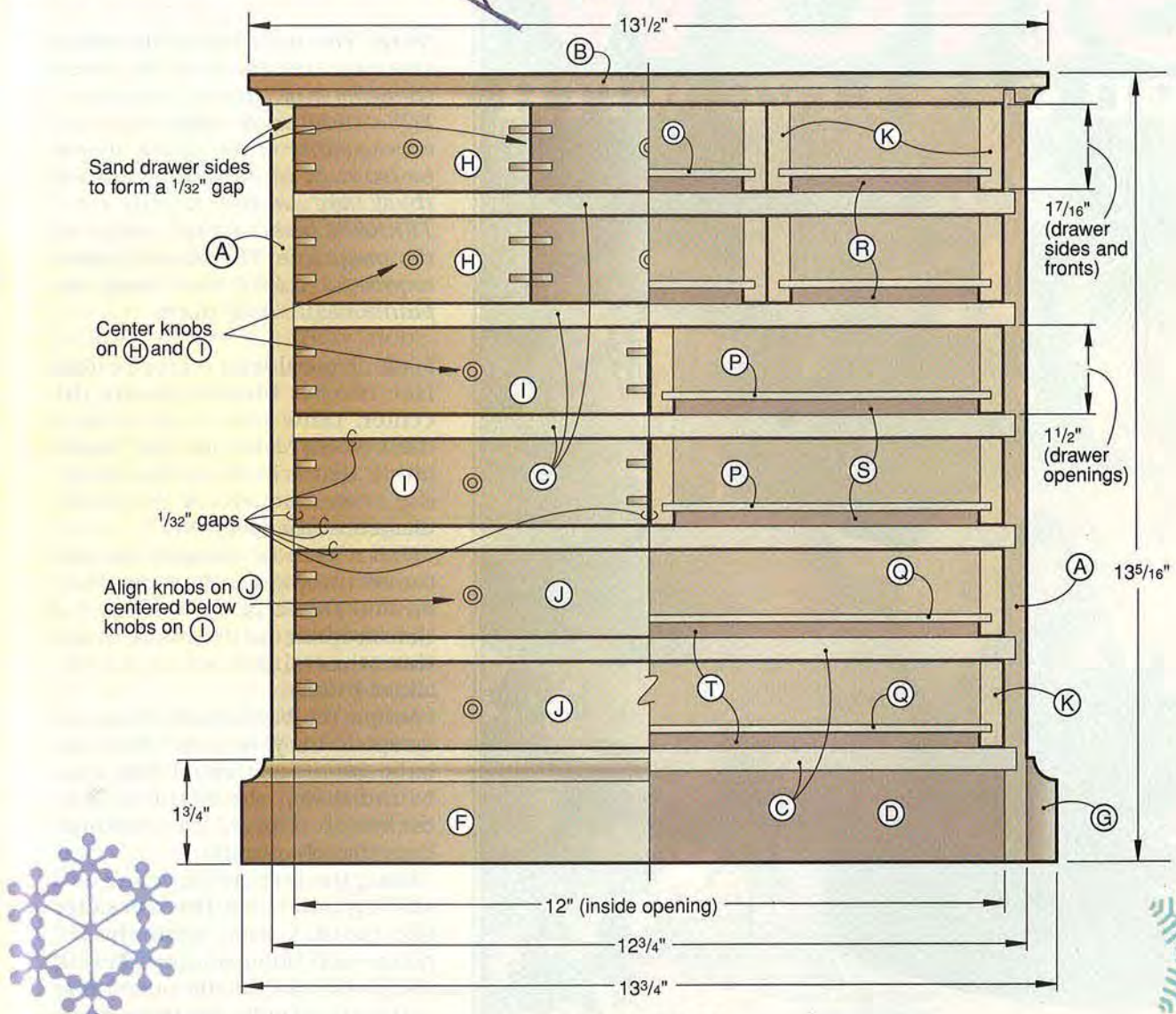
**3** Working from the back of the case, slide the drawer guides in place. The guides should be ⅜" (the same as the thickness of the drawer fronts) from the front of the case. Check for equal gaps and that the drawer fronts are flush with each other and the front of the case. Clamp (no glue) the guides in place from the back of the case. Push the drawers out the front without moving the guides. Use a sharp pencil to mark the location of the guides on the shelves. Using a few drops of glue (no need to overdo it) glue the guides in place. *Immediately reposition the drawers and spacers to verify that the guides are correctly positioned.* Evenly spaced drawers depend on properly positioned guides, so take your time. Repeat the process to install the remaining guides.




**Using the corner kerfing jig for support, cut a pair of kerfs in the front corners of each drawer.**




**Use corner blocks to prevent denting the inside of the drawers when pulling the splines snug into the kerfs.**




**FRONT VIEW**

**4** After gluing all the guides in place, install the drawers, and mark the knob-hole centerpoints where shown on the Front View drawing. Note that the holes in drawer fronts I and J align. The machine screws supplied with the knobs are a bit too long for the ⅜"-thick drawer fronts, so trim each screw accordingly.

**5** Remove the drawers from the assembled jewelry box. Finish-sand as necessary and apply the finish. (We applied a coat of Minwax Natural Danish Oil and let it sit for 30 minutes. While still wet, steel-wool the finish, and wipe dry with a clean cloth. Let this dry completely, and repeat the process with a second coat of finish to completely seal the wood. For added luster, apply a couple coats of 100% tung oil following the directions on the can.)

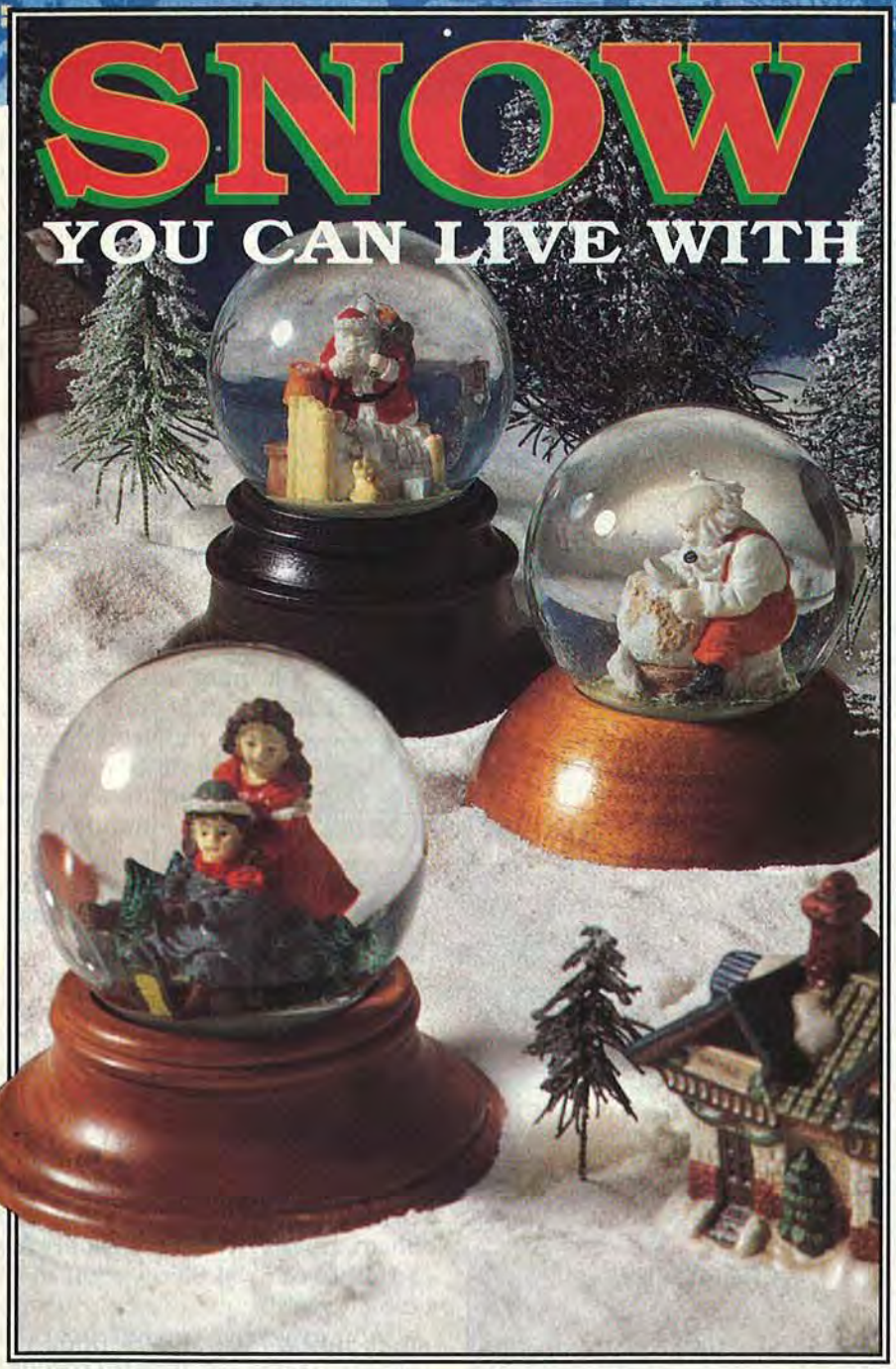
## Buying Guide

**Hardwood kit.** All the individual pieces shown in the Cutting Diagram cut slightly oversized in length and width from the thicknesses listed in the Bill of Materials. Available in cherry, stock no. W75C, $88.95 ppd., or walnut, stock no. W75W $99.95 ppd. Heritage Building Specialties, 205 North Cascade, Fergus Falls, MN 56537. Or call 800/524-4184 to order.

**Knobs.** Twelve solid-brass antique-finish knobs, stock no. 34546, $15.95 ppd. The Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374-9514. Or call 800/279-4441 to order.

Written by Marlen Kemmet
Project Design: James R. Downing
Illustrations: Kim Downing; Roxanne LeMoine

# SNOW YOU CAN LIVE WITH



## Create a keepsake decoration with a simple turning

### Project prep

**Stock:** 2×6×6" or 3×6×6" bowl blank (see text).
**Lathe equipment:** 3-4" faceplate
**Tools:** ¾", ½", and ¼" bowl gouges, ½" bowl scraper, ⅛" or 3/16" parting tool
**Lathe speeds:** roughing, 800 rpm; turning and sanding, 1200-1500 rpm

*Note: The tall snow globe stand shown at the back in the photo contains a music-box movement. For a snow scene without sound, choose either of the stands shown in front of it. Templates for all three are in the WOOD PATTERNS™ insert in the center of the magazine. The musical stand requires a 3×6×6" bowl blank; the plain ones, 2×6×6" stock.*

Mark diagonal lines on the bottom face of your blank to locate the center. Draw two circles around the center. Make one the largest circle that will fit on the blank; the other, the size of your 3-4"-diameter lathe faceplate.

Drill a ⅜" hole through the center of the blank, then bandsaw around the largest circle. Screw the faceplate to the blank inside the other circle, using screws about 1" long.

Mount the bandsawed blank and faceplate on your lathe. With the lathe running at about 800 rpm, round down the blank to 5½" diameter. The ¾" bowl gouge does the job quickly.

Using the hole in the center as a starting point, cut the recess for the globe's base with the ½" gouge and bowl scraper. Test-fit the globe base in the opening as you work. Handle the snow globe carefully—if you drop it, the thin acrylic shell will burst, creating a spectacular mess with all the glitter and liquid inside.

### Turn the stand to shape

Next, turn the outside profile. For the dome-shaped modern stand, form a continuous curve from the rim of the opening to the bottom of the stand. The ½" or ¾" gouge will do the job nicely.

If you're making the traditional-style stand, cut in to the diameters shown with your parting tool. Form the beads at the top with a small gouge. Then, turn the curved side and foot detail.

Follow a similar sequence for the stand with the music movement.

Sand the turning with progressively finer grits from 100 to 220. Don't sand the inside of the recess too smooth—leave some tooth for the adhesive that holds the globe. Apply a clear finish.

Unscrew the turning from the faceplate. If you're making a non-musical stand, sand and finish the bottom. Mount the snow globe, following the instructions in the last paragraph of the article.

## Make room for a music box

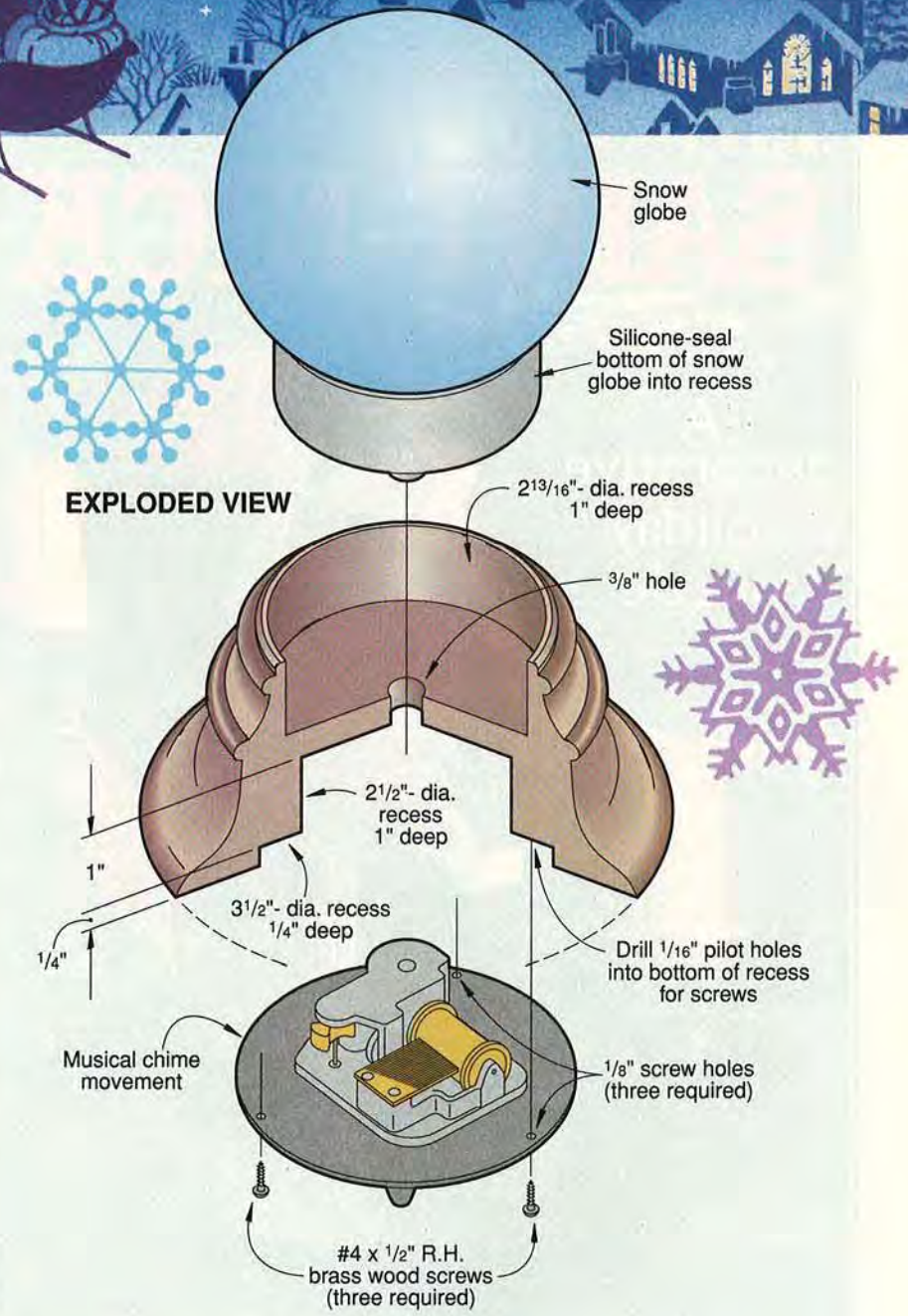
To turn the bottom recess in the music-box stand, first make a jam chuck. To do so, mount a 4"-diameter, 1½"-thick auxiliary faceplate on your lathe faceplate. Turn a tenon on it to mate snugly with the recess in the top of the stand.

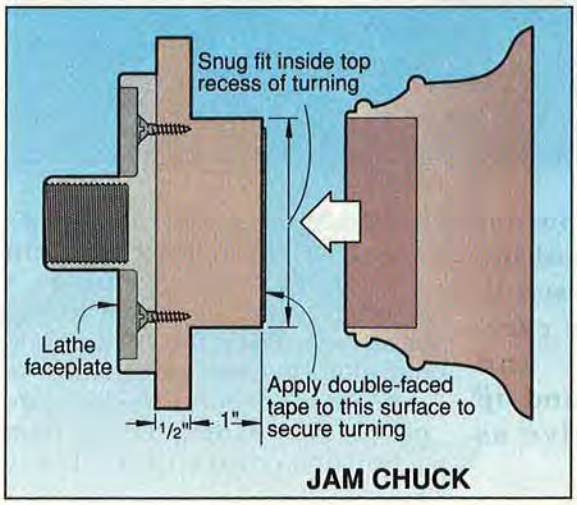
Fit the stand over the tenon, securing it with double-faced tape, if necessary. With a gouge and scraper, turn the 2½"-diameter music-box recess 1¼" deep.

Cut straight into the bottom ¼" deep with a parting tool, ½" from the edge of the music-box recess. Then, with a small gouge, complete the shallower recess, forming a rabbet around the deeper hole. Test-fit the music movement and base assembly. Sand and finish the bottom.

Drill three ⅛" holes around the edge of the plastic base, spacing them approximately equally. Use the base as a template to locate 1/16" pilot holes in the bottom of the stand. Install the movement and base assembly with #4×½" roundhead brass wood screws.

Spread silicone adhesive/sealant around the inside of the top recess. Then, press the snowball into place, seating it firmly as you twist it to spread the adhesive. Allow the silicone to cure in accordance with the package instructions. Finally, tip the snowball over, then let it snow, let it snow, let it snow.


Snow globe
Silicone-seal bottom of snow globe into recess
EXPLODED VIEW
2 13/16"- dia. recess 1" deep
3/8" hole
2 1/2"- dia. recess 1" deep
1"
3 1/2"- dia. recess 1/4" deep
1/4"
Drill 1/16" pilot holes into bottom of recess for screws
Musical chime movement
1/8" screw holes (three required)
#4 x 1/2" R.H. brass wood screws (three required)




## Buying guide

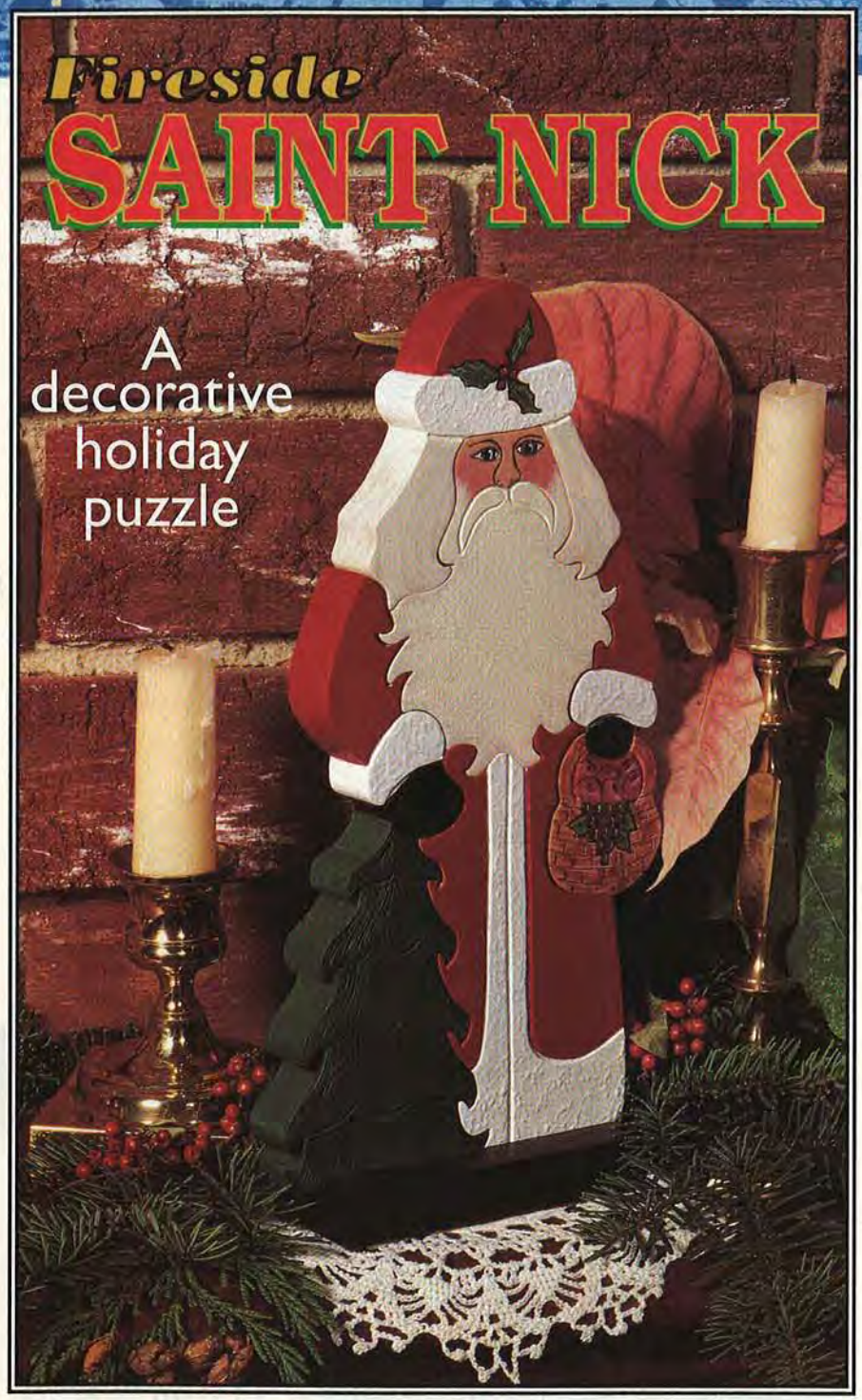
**Snow globe.** Four-inch snow globe, choice of three scenes as shown in photograph. $14.95 ppd. in U.S., Craft Supplies USA, 1287 E. 1120 S., Provo, UT 84606, or call 800/551-8876.

**Musical movement.** Mechanical movement mounted on base, plays "I'll be home for Christmas," $3.95 ppd. in U.S., address above.

Photograph: John Hetherington Illustrations: Kim Downing

# Fireside SAINT NICK

## A decorative holiday puzzle



**'Tis the season for Santa, and here's a rendition of the jolly old gent you can scrollsaw in a jiffy. Simple carving, woodburning, and painting make this stand-up Santa puzzle as festive as yuletide itself.**

Trace the *black* cutting lines from the full-sized pattern *opposite page* onto a ¾×6×10" piece of basswood or clear pine. Place the pattern bottom along one end of the stock.

Scrollsaw around the outside pattern line, starting the cut from a bottom corner. A #5 blade (.038×.016" with 12.5 teeth per inch) will handle the cutting. Next, cut the pieces apart. Here's one way to proceed: Starting at the bottom of the basket, saw up the pattern line on Santa's left arm, returning to the outside at his left shoulder. From there, cut around the line separating his hair from his face, exiting at his right shoulder. Then, cut out Santa's right arm, followed by the tree. Finally, separate the lower portion along the beard line.

Sand the parts as necessary, removing any fuzz along the cuts. Trace the *blue* and *orange* detail lines from the pattern onto the cut-out pieces.

Carve a shallow groove along each *orange* line. Carve the coat hem and collar line on Santa's back. Also on the back, carve the lines on the tree, the left hand and basket, and the fur trim on the hat and sleeves. An incision about 1/16" wide made with a woodcarver's no. 12 V-tool would be ideal. The grooves don't need to meet any particular specification—they just help define features for painting.

Woodburn the *blue* lines, using a skew tip on your woodburning pen. Texture the tree by woodburning fine, sweeping lines on each layer, following the style shown on the top layer on the pattern. Woodburn both sides of the tree. For Santa's basket, woodburn the basket-weave pattern on both sides and the exposed edge. Don't texture the basket handle.

Paint the completed Santa cutout with acrylic artist's colors. Paint the exposed edges, but not the joining edges. Kansas City artist Fern Weber, who designed our Santa, used these Delta Ceramcoat colors, shown on the pattern: Berry red (BR), Indiana rose (IR), Copen blue (CB), Green isle (GI), Wedgwood green (WG), Dusty purple (DP), Burnt sienna (BS), Burnt umber (BU), Light ivory (LI), White (WT).

Print this article

To create the fur texture, add a bit of gel thickener to the white paint. (The paints and thickener are available at crafts stores.) When you paint the eyes and grapes, paint each circle with the base color first, let dry, then add the comma-shaped LI highlights.

Paint the basket with IR. When that coat dries, dry-brush BS over it. To dry-brush, clean your brush and dry it. Then, pick up a small amount of BS paint by patting the surface with the brush. Apply the paint to the basket with light, brisk strokes—just enough to leave a hint of color.

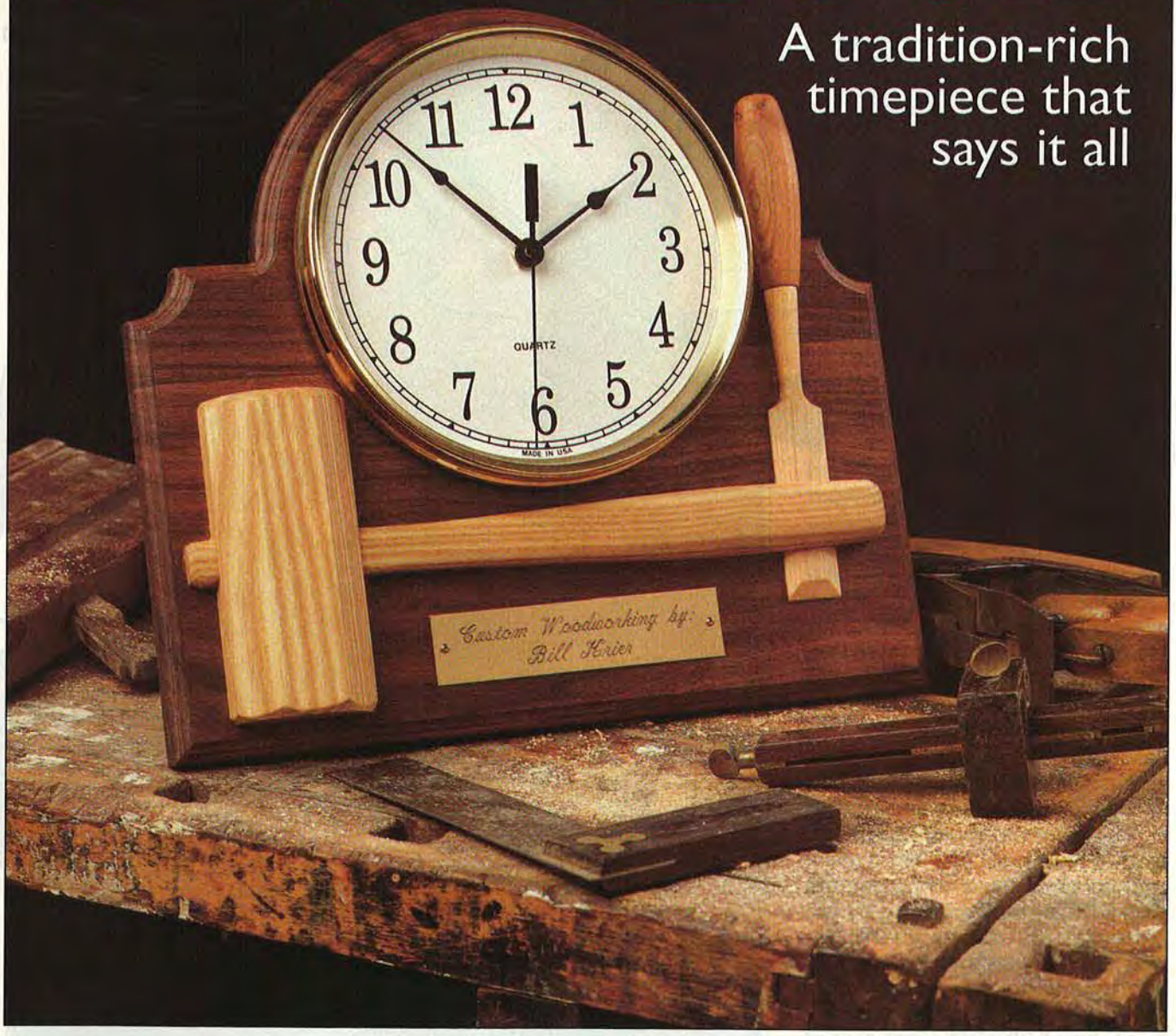
Give Santa rosy cheeks by applying a dot of BR to the wet coat of IR on each side of the nose. Then, blend the dots into the cheeks. Spray the completed project with matte-finish clear acrylic.

For a base, saw or rout a ¾" groove ⅜" deep along the middle of a ¾×1⅞×3¾" piece of stock. Paint the stand black.

Project Design: © Fern Weber
Photograph: John Hetherington
Illustrations: Kim Downing

# *Signature* SHOP CLOCK

## A tradition-rich timepiece that says it all




**Like all of the other projects we designed for Idea Shop™ 2, this wall-mounted clock had to meet two criteria. First, it had to perform its task well. And second, it had to be an attractive addition to our workshop. To address the first, we selected a clockface with large numerals so that you can tell time easily from anywhere in your shop. And as for the second criteria, we think you'll agree this clock is good enough to grace the wall of any workshop.**

**To personalize it, order your own computer-engraved plate for under $6. See the Buying Guide for ordering details.**

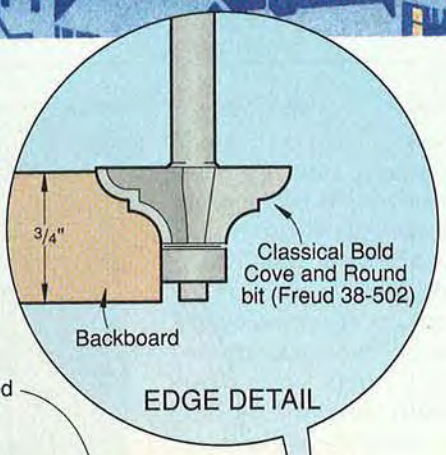
### The backboard comes first

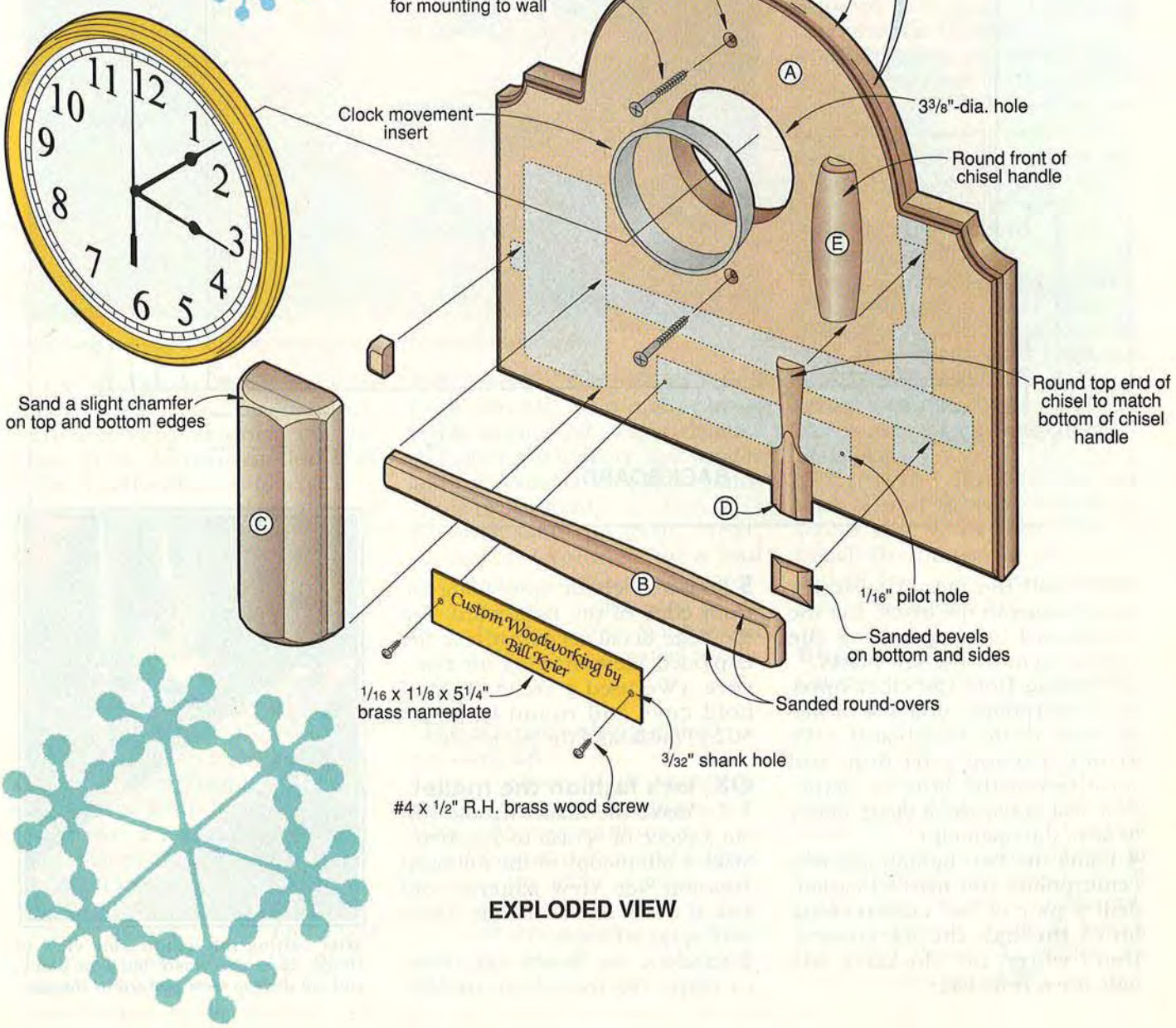
**1** Edge-join enough ¾"-thick walnut to form a 13" wide by 14" long backboard blank.

**2** Trim the backboard (A) to the size noted on the Backboard drawing. Transfer the backboard outline (see the dimensioned pattern on the *WOOD PATTERNS™* insert in the center of the magazine), the clock-opening center-

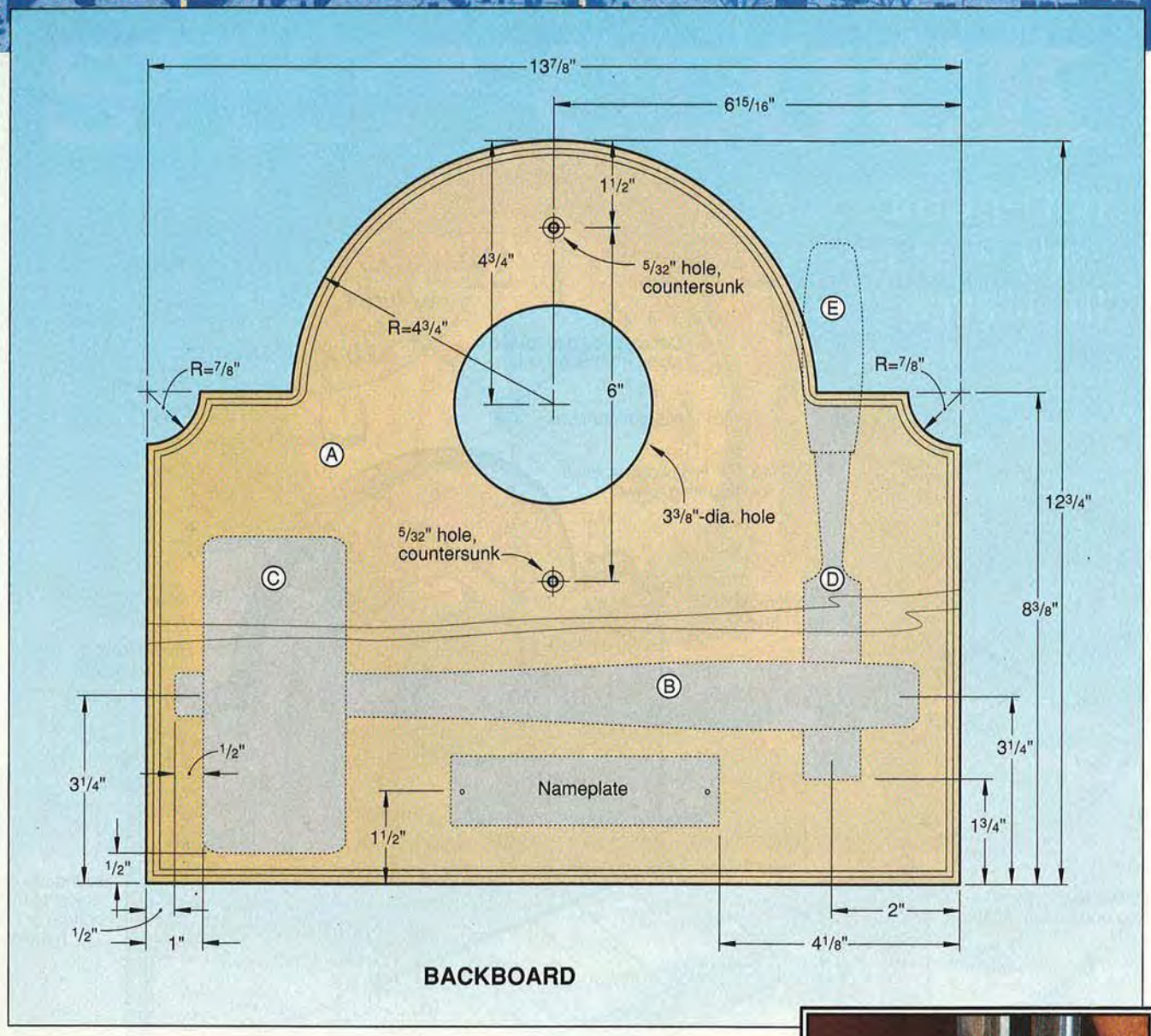
*Continued*

For full-sized patterns of the backboard (A), mallet handle (B), mallet head (C), chisel blade (D), and chisel handle (E), see the WOOD PATTERNS™ insert in the center of the magazine.





Decorative edge routed along front edge only
5/32" hole, countersunk
#8 x 2" F.H. wood screws for mounting to wall
Backboard
A
3 3/8"-dia. hole
Clock movement insert
Round front of chisel handle
E
Round top end of chisel to match bottom of chisel handle
Sand a slight chamfer on top and bottom edges
C
D
B
1/16" pilot hole
Sanded bevels on bottom and sides
Custom Woodworking by Bill Krier
1/16 x 1 1/8 x 5 1/4" brass nameplate
Sanded round-overs
3/32" shank hole
#4 x 1/2" R.H. brass wood screw

**EXPLODED VIEW**




**BACKBOARD**

point, and the mounting-screw centerpoints to the blank. Cut the backboard to shape. Sand the edges to remove the saw marks.

**3** Working from the clock-opening centerpoint, cut a 3⅜"-diameter hole in the backboard. (We drilled a blade start hole and scrollsawed the hole to shape. You also could use a circle cutter to form the opening.)

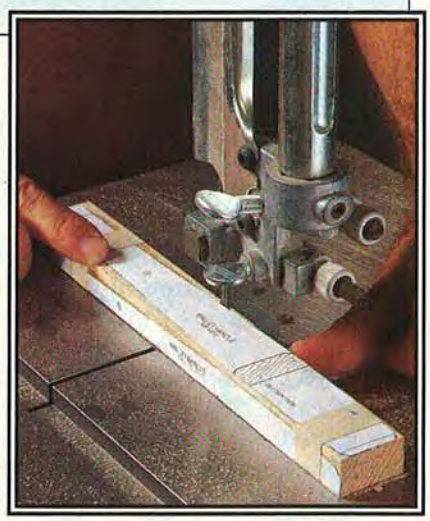
**4** Using the two mounting-screw centerpoints you marked earlier, drill a pair of 5/32" countersunk holes through the backboard. Don't worry, the clockface will hide the screws later.

**5** Rout a ¼" classic cove along the front edge of the backboard. See the Edge detail accompanying the Exploded View drawing for reference. (We used a Freud classical bold cove and round bit, #38-502.) Finish-sand the backboard.

## OK, let's fashion the mallet

**1** To make the mallet handle (B), cut a piece of ¾" ash to 1¼×10⅜". Make a photocopy of the full-sized Top and Side View patterns, and attach them to the handle blank with spray adhesive.

**2** Bandsaw the handle Side View to shape the top of the handle.



**After cutting the handle side view to shape, tape the waste back in place, and cut the top view pattern to shape.**

**Bevel-rip the edges of the laminated-ash mallet-head blank at 45°.**

Tape the waste stock back in place (it's got the Top View pattern attached), and then cut the Top View pattern to shape as shown in the photo *below left*.

**3** Sand round-overs along the top edges of the handle where shown on the Section View portion of the full-sized Top View handle pattern. Crosscut a ½"-long piece off the end of the mallet handle, and set both pieces aside for now.

**4** To form the mallet head (C), glue and clamp two pieces of ¾×3×10" ash face-to-face. (We made the mallet-head blank 10" long for safety when bevel-ripping it to shape.) Rip and plane both edges for a 2⅜" finished width, and then plane or resaw for a 1⅛" final thickness.

**5** Bevel-rip the edges at 45° where shown on the Full-Sized Patterns drawing. See the photo *above* for reference.

**6** Crosscut a section 5⅜" long from the 10"-long mallet-head blank. Then, sand a slight chamfer (we used a stationary disc sander and palm sander) around the ends of the mallet head.

**7** Finish-sand the parts. Next, using the Exploded View and Backboard drawings for reference, glue the mallet parts (B, C) to the backboard (A). Don't forget to add the ½"-long mallet handle end piece.

## One sharp-looking chisel coming up

**1** Cut a piece of ½" maple to 1×4½" for the chisel blade (D). Make a photocopy of the Side and Top View patterns and adhere them to the blank. Cut the Side View pattern to shape. Use double-faced tape to adhere the waste stock (it's got the Top View pattern on it) to the chisel blank.

**2** Using the Top View pattern and Blade Section views as a reference, cut and sand the blade top surface and bevels to shape. (You might find it just as easy to use your own 1"-wide chisel as a guide when shaping the blade.)

**3** Crosscut the chisel blade into two pieces where shown on the Full-Sized Patterns drawing. To ensure the glued-down chisel blade pieces appear straight (the portion of the mallet handle they're glued next to is curved), contour-sand the cut edges of the blade to butt snugly against the curved mallet handle.

**4** Cut and sand the chisel handle (E) to shape from ¾"-thick cherry.

**5** Finish-sand all the pieces, and glue them to the walnut backboard where shown on the Backboard drawing.

## Add the finish, and hang up the clock

**1** Apply the finish of your choice. (We sprayed on three coats of aerosol polyurethane; aerosol lacquer also would work.) Position and screw the brass plate in place. (See the Buying Guide for our source of custom-engraved brass plates.)

**2** Screw the clock to the wall with a pair of #8×2" flathead wood screws or toggle bolts. Install the battery in the clock, and fit the movement into the hole in the backboard.

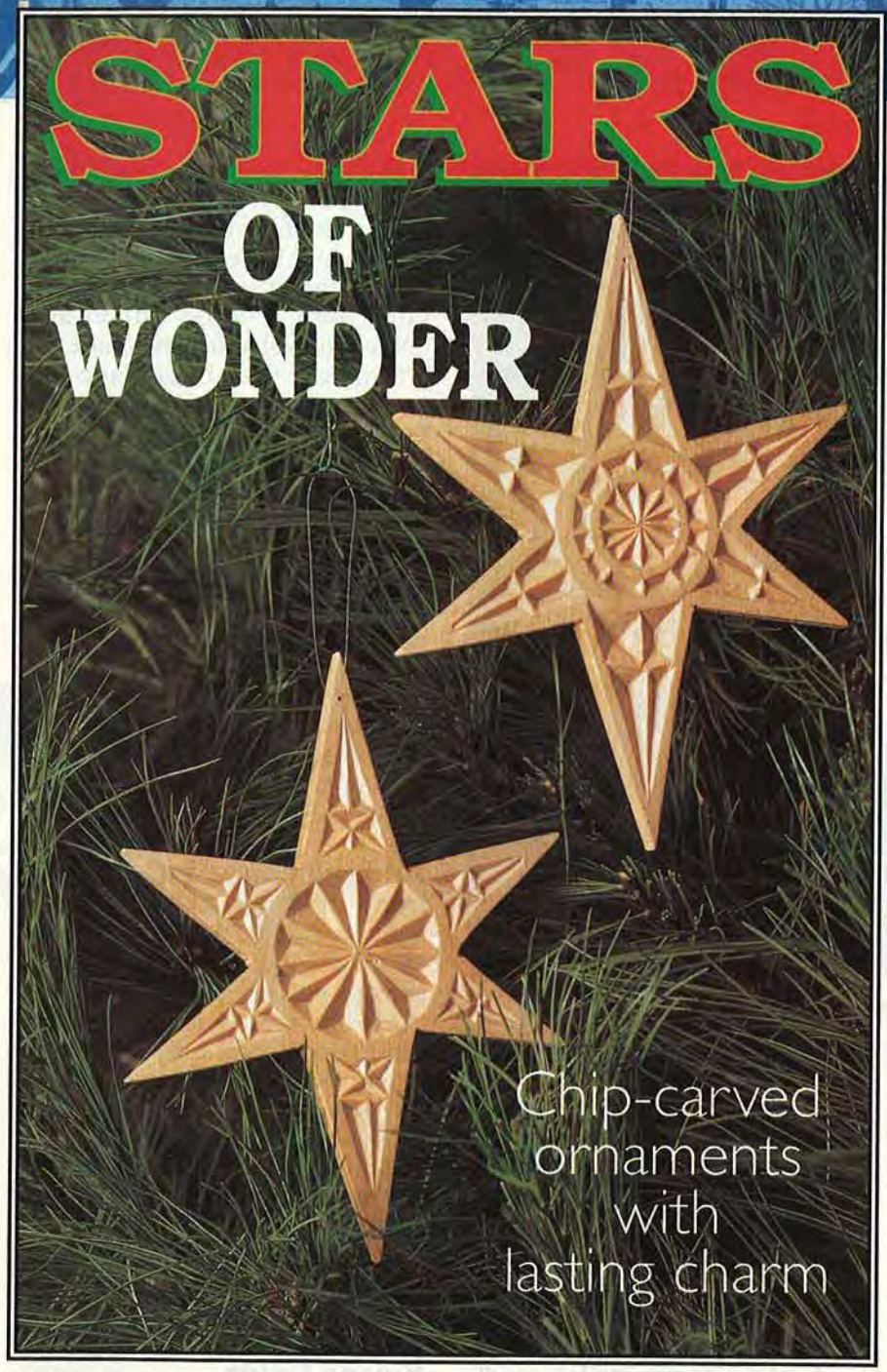
## Buying Guide

**Quartz clock insert.** 8¼"-diameter insert with Arabic dial. Stock no. 15141. $28.75 ppd. Klockit, P.O. Box 636, Lake Geneva, WI 53147. Or call 1-800-556-2548.

**Engraved plate.** 1⅛×5¼" satin brass with the words "Custom Woodworking by (your name)" in black double-lined letters. $5.29 ppd. Two screws included. Custom Awards, 1425 22 Street, West Des Moines, IA 50266. No phone orders please.

Produced by Marlen Kemmet Project Design: James R. Downing Illustrations: Kim Downing Photographs: King Au

# STARS OF WONDER




**Chip carving's old-world character lends enchantment to these yuletide stars. They're sure to shine as family favorites.**

## Project prep

**Stock:** Basswood or other carving wood, 5/16×4¼×5¾".
**Knife:** Chip-carving knife

CHIP -CARVING KNIFE

Photocopy the ornament patterns on the *WOOD PATTERNS*™ insert in the center of the magazine. Transfer the one you want to start with to a 5/16×4¼×5¾" piece of basswood, tracing both the outline and the interior carving lines.

For best results, tape the pattern's top edge to the stock. Slide a piece of graphite transfer paper or carbon paper under the pattern. Trace the lines with a sharp pencil or a stylus. A French curve, compass, and straightedge will help you trace accurately.

When you're done, spray a light coat of clear wood finish over the traced lines. This will prevent them from smearing as you work.

Because you will be holding the workpiece on your lap to carve, don't cut out the star yet. The rectangle is easier to hang onto than the star shape, and it provides more hand support while carving.

### One knife does the trick

In chip carving, you create geometric patterns and designs in wood by removing precise chips. Cutting those chips requires only one tool, a chip-carving knife, shown *below left*. To succeed, you must keep that knife sharp and hold it correctly.

To sharpen the knife, hone it on an ultra-fine stone. Hold the side of the blade at a 10° angle to the stone. Resharpen the knife periodically as you work to ensure clean, crisp cuts. When cutting takes more effort or when cross-grain cuts look fuzzy, it's time to hone the blade.

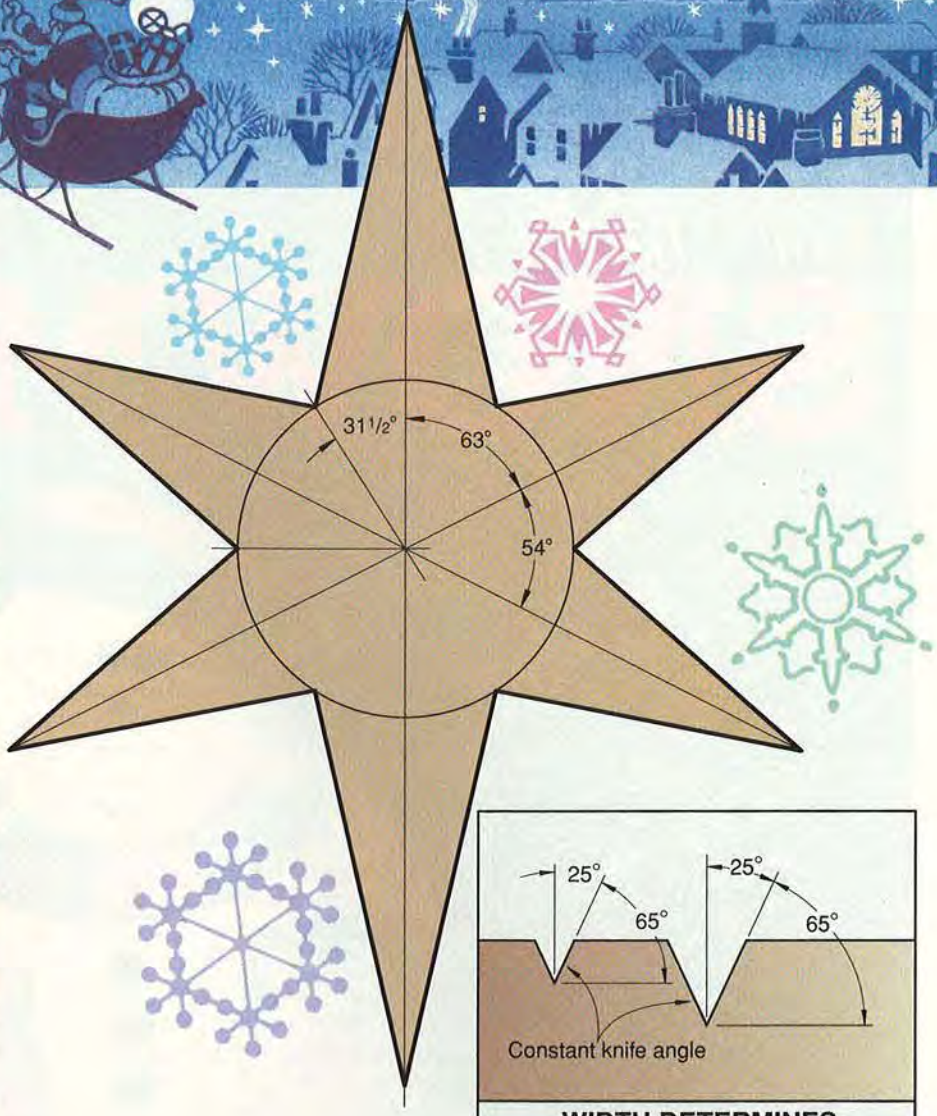
There are two ways to hold the knife. For the first grip, which you'll use most often, grasp the knife in your right hand (or left, if you're left-handed) with the first joint of your thumb at the blade end of the handle. Wrap your fingers around the handle so the handle's top edge runs diagonally across the palm of your hand.

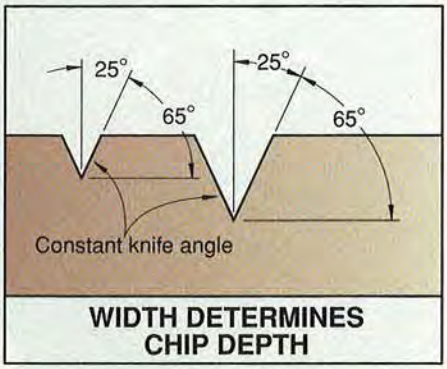
Hold the workpiece in your lap. Turn your knife-hand wrist so you can rest the tip of your thumb and the knuckle of your index finger on the wood, placing the blade at about a 65° angle to the wood, shown *opposite page top*. Bring your carving-arm elbow close to your body.

For the second grip, roll the knife handle in your hand so the meaty part of your thumb presses on the blade's spine, as shown

**Always keep your index-finger knuckle and thumb on the wood while carving with the first grip position.**

**Move your thumb to the back of the blade for the second position.**




**WIDTH DETERMINES CHIP DEPTH**

*above*. This position puts the other side of the blade at a 65° angle to the wood, enabling you to cut in the opposite direction.

In many cases, you'll find it easier to turn the workpiece than to be changing your knife grip constantly. But, since you should attempt to cut away from already completed work, the second grip comes in handy at times.

## Let's make some chips

Begin carving with the largest chips at the outside of the pattern—the star points, in this case. Whenever you cut a chip, make the cross-grain cut or cuts first.

To begin carving your ornament, take the knife in the first grip, and place the point at the far end of your first cutting line. Slice into the wood as you draw the knife along the line, maintaining a constant 65° angle between the blade and the wood.

This fixed knife angle means that the width of any chip determines its depth (they'll be approximately equal), shown in the illustration *above right*. As you carve, visualize where the tip of the knife is in the wood. Cut deeply enough to reach the center of the chip. In a chip with equal-length sides, the cuts will meet at a central point.

For a clean, crisp carving, strive to cut each side of every chip in one thrust. For a triangular chip, cut the first pattern line. Then, turn the wood to make the second cut, keeping the workpiece close to your body. Turn it again for the third cut. If all goes well, the chip will pop out as you complete the chip's final cut.

Move to the adjacent chip, and cut it similarly. As much as possible, avoid cutting toward completed work as you continue to carve the design.

## A few final touches

After completing the carving, scrollsaw or bandsaw along the outside pattern line. Drill a 1/16" hole near the tip of one of the long star points. Lightly sand the ornament to remove any remaining pattern lines, if necessary. Then spray on a clear finish. Tie a loop of sewing thread or fishing line through the hole for hanging.

To try your own designs, draw the star outline on a piece of paper, using the angles shown *above*. Lay out your design, then transfer it to the stock for carving as described.

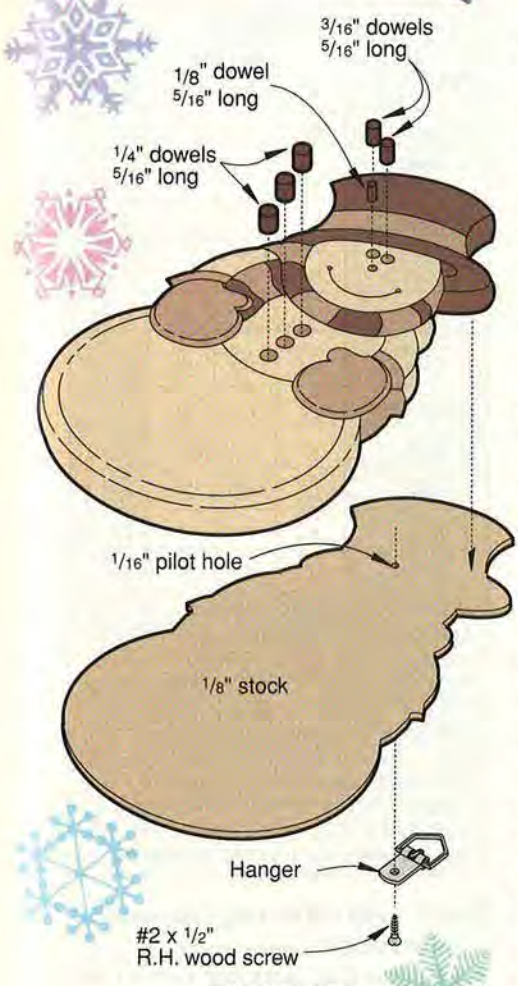
Project Design: Linda Frazier Photographs: King Au; John Hetherington Illustrations: Kim Downing,

# Let's build a SNOWMAN

## But let's build it indoors

**Living in the snowbelt, we've seen some great snowmen in our time, but few as charming as this wonderful wooden one from Texan Judy Gale Roberts. What's more, you can build him without freezing your fingers, and he won't melt away on the first warm day.**

***Note:*** *Build the snowman from three different woods, selected by color. You'll need a ¾×5×7" piece of light-colored wood, a ¾×3½×6" piece of medium-colored wood, and a ¾×3×6" piece of dark-colored wood. For the snowman shown, designer Judy Gale Roberts employed light-colored white pine and two colors of western red cedar. You could use other softwoods or hardwoods. You also could dye or stain the woods for your snowman if the natural color variations don't provide sufficient contrast. You'll need a piece of plywood ⅛×5×8½" for the back.*




**EXPLODED VIEW**

Photocopy the full-sized patterns in the *WOOD PATTERNS*. Cut out the individual patterns, but do not snip the patterns for the mittens (B and D), the scarf (F and H), or the hat rim (J) into their separate pieces.

Using rubber cement or spray adhesive, adhere each pattern to an appropriate piece of stock, aligning the arrow on the pattern with the wood's grain. Stick down the pattern edges firmly so they won't flap while you cut. For the scarf (F and H), attach a ¾×2×3½" piece of dark stock to the top of a same-sized piece of medium-colored stock, using double-faced tape. Apply the patterns to the top of the stack.

Drill the holes in parts C and I where shown. Drill the 1/16" blade start holes all the way through; the holes for the buttons, eyes, and nose, ¼" deep. Insert the scrollsaw blade (no. 5, .037×.015" with 14 teeth per inch) through one of the blade start holes, and saw the curved mouth. Saw the mouth in a smooth, fluid motion. A smooth curve gives the snowman his winning smile.

## Cut and shape the parts

When you cut out the parts, saw right down the middle of the outside pattern line for each one—don't leave the pattern line on either the waste or the part. After you cut out the lettered parts, saw the mittens (B and D), the hat rim (J), and the stacked scarf parts (F and H) into their smaller pieces.

An auxiliary scrollsaw table with a zero-clearance blade hole will help you perform those small cuts. To make the table, cut a piece of ⅛" or ¼" plywood to cover your saw's table top. Center the plywood side-to-side on the table, in front of the blade. Saw into the plywood until the edge nearest you meets the front edge of the saw table. Secure the auxiliary table with double-faced tape.

Separate the dark and medium stack-cut scarf pieces, then intermix them to assemble the scarf, following the pattern and the photograph. Sand all parts to remove fuzz or splinters from sawing. Assemble the snowman to check the fit between parts, and sand or trim as necessary.

Contour the pieces with a drum sander or disk sander (an inflatable drum sander works great). Shape the pieces, following the thickness dimensions shown on the pattern for guidance. You don't need to hew to those dimensions precisely, however.

Start with the bottom snowball (A). Shape it like a portion of a sphere, sanding it to about ⅝" thick at the center. Next, lay the middle snowball (C) in position next to it. With a sharp pencil, mark the bottom snowball's thickness onto the middle one's edge where they meet.

Shape the middle snowball as part of a sphere, but make the mating edge at least as thick as marked. Then, place the mittens in position. Mark the thicknesses of the adjoining parts on the mittens, and sand them to shape. Contour all parts in this fashion. Treat the scarf as a single piece—don't shape the individual segments. For the hat, start with the top and work down to the brim.

## Now, build your snowman

Dry-assemble the completed parts on a piece of ⅛"-thick plywood. Trace around the outside of the snowman, and scrollsaw the plywood to shape for the backing. Fill any voids, and sand the edge.

Finish the front and edges of each part before assemby to prevent building up finish in the joints. A clear wipe-on gel finish will do the job. Paint or stain the edge of the backing dark.

Glue the parts to the backing, starting with the bottom snowball. Spare the glue—a few dots of yellow woodworking glue on the back of each part will hold adequately and won't squeeze out around the edges or in the joints. Insert 5/16" lengths of dowel where shown. Dab a bit of black paint or dark stain on the end of each one. Finally, add a picture hanger on the back.

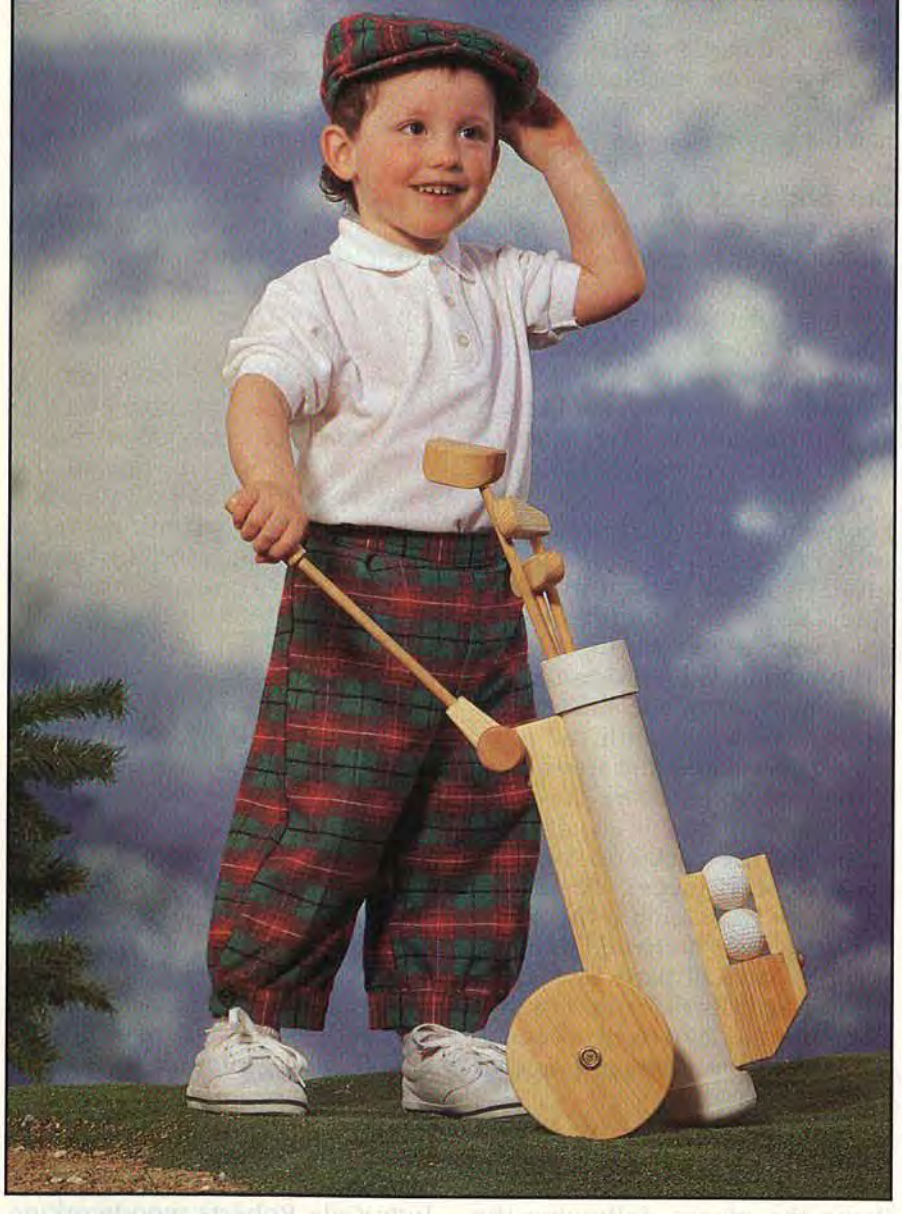
## Buying Guide

**More designs.** For a list of other Judy Gale Roberts woodworking patterns, send a self-addressed stamped envelope to Roberts Studio, 3302 Atkinson Drive, Lufkin, TX 75901.

Project Design: © Judy Gale Roberts
Photograph: John Hetherington
Illustrations: Kim Downing

*For first-time golfers*

# PEE-WEE STARTER SET



**Miniature golf takes on a whole new meaning with this kid-sized pull cart, bag, and clubs. The wheels and adjustable handle on the pull cart allow promising young Palmers to move over the grassy backyard links with ease. We recommend using hollow plastic balls with the club set, which includes a wood, an iron, and a putter.**

**Bill of Materials**

| Part | Finished Size T | W | L | Matl. | Qty. |
|---|---|---|---|---|---|
| A bag support | ¾" | 1½" | 11¾" | P | 1 |
| B wheel spreader | ¾" | 2" | 7" | P | 1 |
| C wheels | ¾" | 5" dia. | | P | 2 |
| D spacer block | 1½" | 2" | 3" | P | 1 |
| E ball holders | ¾" | 1½" | 6" | P | 2 |
| F handle tongue | ¼" | 1¼" | 2¾" | PL | 1 |
| G connector | ¾" | 1¼" | 2¾" | P | 1 |
| H knob | ¾" | 1½" dia. | | P | 1 |
| I putter | ¾" | 1" | 2¾" | P | 1 |
| J iron | ¾" | 1¼" | 3" | P | 1 |
| K wood | 1¼" | 1¼" | 2½" | P | 1 |

**Materials Key:** P–pine, PL–plywood.
**Supplies:** 2" PVC pipe 13½" long, 2" PVC pipe coupling, 2" PVC pipe cap, 2–#10×2" flathead brass wood screws with #10 brass finish washers and #10 (1") fender washers, 2–#10×2½" flathead machine screws with lock washers and nuts, 1–#10×1¾" flathead machine screw with lock washer and nut, #8×1¼" flathead wood screws, ⅜" dowel stock, ½" dowel stock, ⅜" wood buttons, 1¾6×1¼" carriage bolt with #10 threaded insert and #10 flat washer, clear finish.

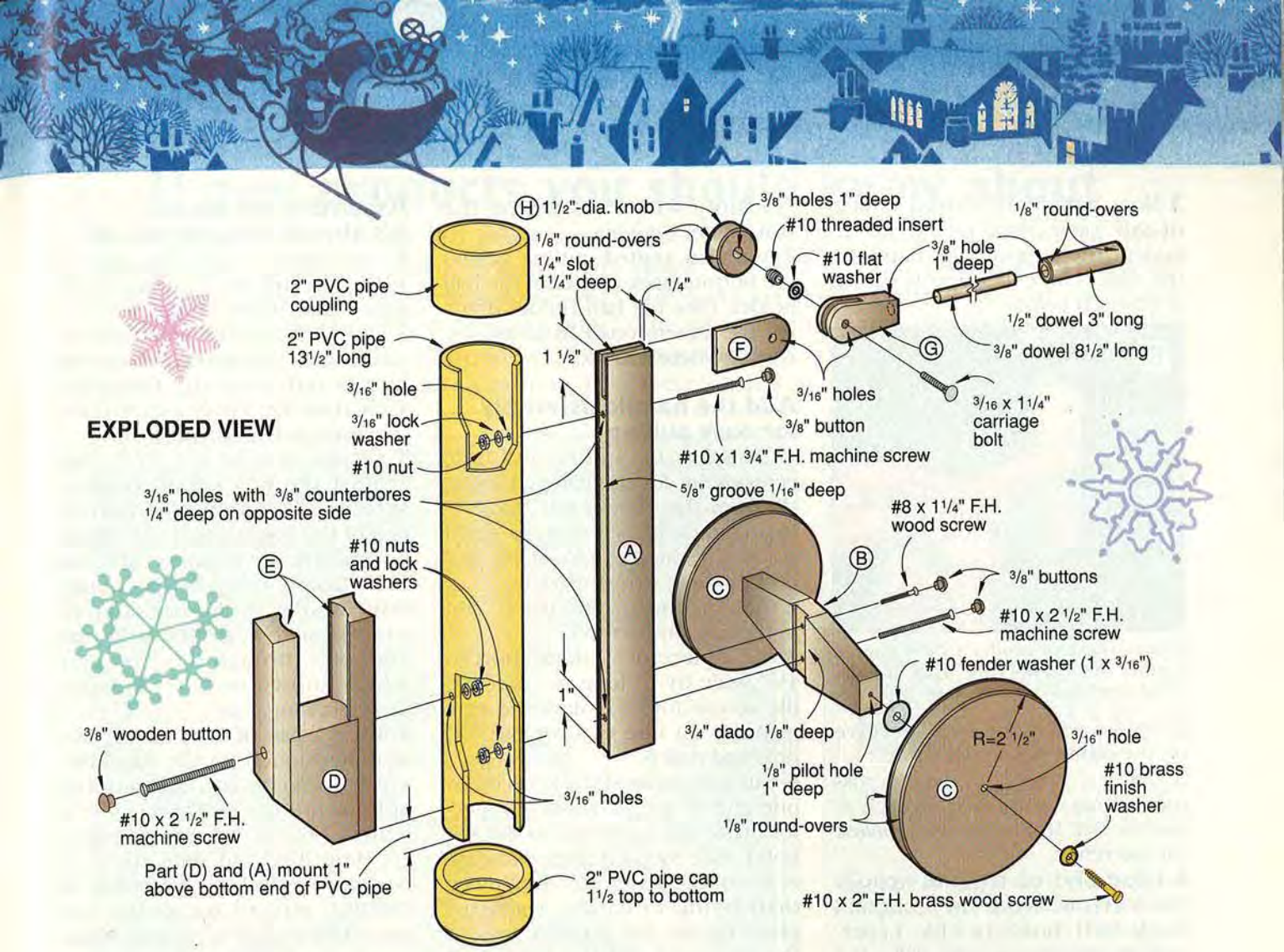
## Start with the bag support and wheels

**1** Cut the bag support (A) to the size listed in the Bill of Materials. Cut a ¼" slot 1¼" deep in the top end (we did this with a bandsaw).

**2** Fit your tablesaw with a dado blade and cut a ⅝" groove 1⁄16" deep centered along one edge of the bag support. (The groove allows for a tighter fit of the bag support against the PVC pipe.)

**3** Drill a pair of 3⁄16" holes through the bag support where dimensioned on the Exploded View drawing. (During assembly, you'll run hardware through these holes for attaching the bag support to the 2" PVC pipe.)

**4** Cut a piece of ¾" stock to 2×7" for the wheel spreader (B). Cut a ¾" dado ⅛" deep across the center of the spreader where shown on the *WOOD PATTERNS™* insert in the center of the magazine.




**5** Drill a ⅛" pilot hole 1" deep centered in each end of the wheel spreader. Drill two counterbored screw holes through the spreader for securing it to the bag support (A) later. The hole sizes are listed on the *WOOD PATTERNS™* insert.

**6** Transfer the shape of the spreader to the 2×7" blank and cut it to shape.

**7** Use a compass to mark the 5"-diameter wheels on ¾" stock. Carefully cut the wheels to shape cutting just outside the marked line. Then, sand to the line (we used our disc sander) to finish shaping the wheels.

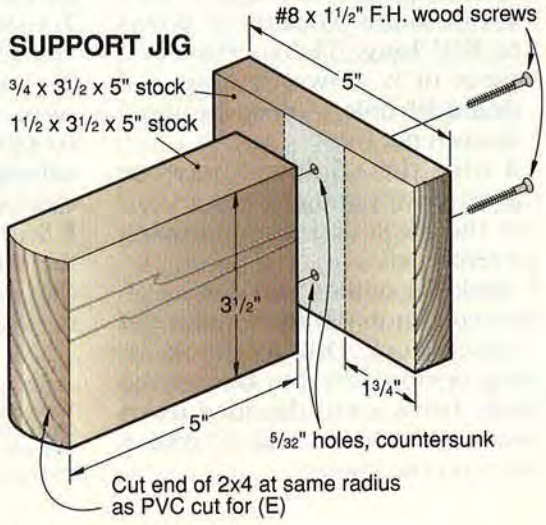
**8** Drill a 3/16" hole through the center of each pine wheel. Then, rout or sand ⅛" round-overs along the outside edges of each wheel.

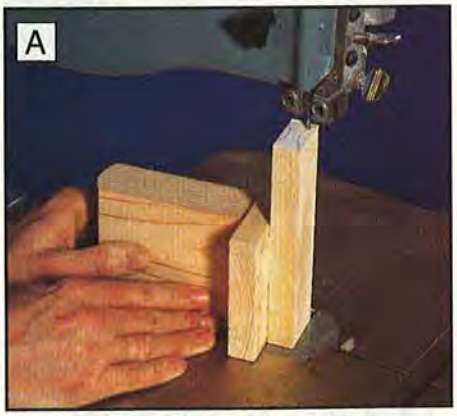
## Make the golf-ball holder next

**1** From 1½"-thick stock, cut the ball-holder spacer block (D) to size. Cut the ball-holder front and back (E) to ¾×1½×6" each.

**2** Transfer the full-sized top view pattern to the top of each E. Build a support jig like that shown on the Support Jig drawing. Using double-faced tape, adhere one of the ball-holder pieces (E) to the flat end of the support jig. As shown in Photo A, bandsaw the curve in the opposite face.

*Continued*



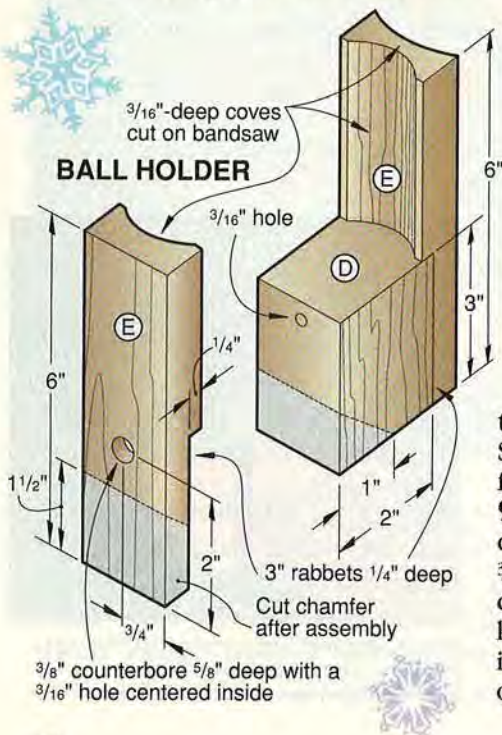




**Use a support jig to control the ball holders when bandsawing their coved surfaces to shape.**

**3** Now, adhere the curved surface of this same piece to the curved end of the support jig. Bandsaw the other curve to shape as shown in Photo B *below*.

**Secure the ball holder to the curved end of the support jig with double-faced tape, and cut it to shape.**

**4** Bandsaw just the smaller curve on the other ball-holder piece.
**5** Cut a 3" rabbet ¼" deep across the bottom inside face of each E. See the Ball Holder drawing *below* for reference.
**6** Glue and clamp the spacer block (D) between the front and back ball holders (E). Later, remove the clamps, and drill a 3/16" counterbored hole through the assembly where shown on the Ball Holder drawing.
**7** Mark an angled cutline across the bottom back corner of the ball holder. (See the Ball Holder drawing for dimensions.) Bandsaw the corner where marked.




## Add the handle assembly for easy pulling

**1** Transfer the outline and hole centerpoint for the handle tongue (F) from the *WOOD PATTERNS™* insert to ¼" plywood or solid stock. Cut the piece to shape, and drill the hole where marked.
**2** Glue the tongue into the ¼" slot in the bag support (A).
**3** Cut a piece of ¾"-thick stock to 1¼" wide by 6" long for the handle connector (G). Mark the centerpoint on one end for the 3/16" hole and drill it.
**4** Cut a ¼"-wide slot 1¼" deep in one end of the ¾×1¼×6" connector blank (the same end as the 3/16" hole). (We found it safer and easier to cut the slot in a 6"-long piece than trying to handle a shorter piece on the bandsaw.) Crosscut the opposite end for a finished length of 2⅝".
**5** Mark diagonals on the end opposite the slot to find center. Holding the connector with a handscrew clamp, drill a ⅜" hole 1" deep where marked.
**6** Transfer the full-sized connector pattern to the connector blank and cut it to shape.
**7** Crosscut a piece of ⅜" dowel to 8½" long. Then, crosscut a piece of ½" dowel 3" long, and drill a ⅜" hole 1" deep centered in one end.
**8** Glue the ⅜" dowel between the ½" dowel and the connector. See the Exploded View drawing for reference.
**9** Mark the outline and cut a 1½"-diameter knob (H) from a piece of ¾"-thick stock. Drill a ⅜" hole ½" deep centered in one face of the knob. Drive a #10 threaded insert into the ⅜" hole. Sand ⅛" round-overs on the knob.

## Assemble the pieces; it's almost time to tee off

**1** Cut a piece of 2" PVC pipe to 13½". Sand off any lettering on the pipe with 320-grit sandpaper.
**2** Finish-sand all the wood pieces, sanding ⅛" round-overs on the pieces noted on the Exploded View drawing. Apply a clear finish (we used polyurethane).
**3** Clamp or tape the PVC pipe against the bag support/wheel spreader assembly. The bottom end of the bag support (A) should be 1" above the bottom end of the 2" PVC pipe. Using the previously drilled holes in the bag support and spreader as guides, drill mating holes through the PVC pipe where shown on the Exploded View drawing.
**4** Insert a pair of machine screws, as dimensioned on the Exploded View drawing, through the top hole in the bag support and the bottom hole in the wheel spreader. Hold hexhead nuts and lock washers in place on the inside of the PVC pipe to secure the two assemblies. Glue ⅜" wooden buttons in place over the heads of the machine screws.
**5** Secure the ball holder to the PVC pipe with a machine screw.
**6** To prevent scratching the clubs when slipping them in and out of the bag (PVC pipe), file the exposed machine screw flush with the nut and then place duct tape over the exposed nuts.
**7** Using PVC joint cement caulk adhesive, or instant glue, adhere a 2" (inside diameter) PVC pipe cap onto the bottom end of the 2" (outside diameter) PVC pipe. Also, adhere a 2" PVC pipe coupling to the top end of the PVC pipe.
**8** With brass wood screws, mount the wheels to the wheel spreader (B). Fasten the handle assembly to the bag support/ tongue.

*Continued on page 82*

Written by Marlen Kemmet
Project Design: Joe Geyser, Antioch, Calif.
Illustrations: Jamie Downing
Photographs: Bill Hopkins, John Hetherington

# BANDSAWS AND CIRCULAR BLADES:
## 11 new products you should know about

**It never fails. As soon as we tell you everything we know about a particular new tool or product category, manufacturers come out with still newer models that deserve our attention (and yours). This happened after we published our reviews of dado cutters in the October 1991 issue, bandsaws in April 1992, and 10" circular blades in September 1993. As soon as we could get our hands on the new products, we ran them through the same tests that the original tools endured. Here's what we discovered.**

### Freud's Super Dado leaps others in a single bound

In our last report on dado blades and sets, the 8" Forrest Dado King ruled the roost, but with a price tag befitting its regal standing: $289. Other dado-blade sets performed nearly as well for less than half the price, including the Freud SD308, Amana 658030, and Delta 35-560.

Now, Freud's new 8" Super Dado, model SD508, performs as well as the Forrest, with a price of about $180. (You also can buy a 6" version, model SD506, for about $160.) In our tests, the SD508 made flawless cuts in solid wood, oak-veneered plywood, and melamine-coated particleboard.

Like the Forrest set, the Super Dado features 24-tooth outside blades, four-tooth chippers, a 3/32"-thick chipper for undersized plywoods, and a set of shims.

The Super Dadoes also have teeth with anti-kickback design. Other nice touches include a sturdy plastic carrying case and an instruction book with diagrams of all the possible chipper combinations.

**Two strong contenders for your bandsaw dollar: the Jet WBS-14 (left) and the Grizzly G1073.**

### Grizzly and Jet debut improved bandsaws

When we last examined bandsaws, the Delta 14" models 28-283 (¾-hp motor and enclosed base) and 28-245 (the same saw with a ½-hp motor and an open base) were the clear winners among machines priced $500-$1,000. At the time, the Grizzly and Jet bandsaws in this price range were not serious challengers to the Delta units. All that has changed.

For several months we put the new Grizzly model G1073 and Jet WBS-14 bandsaws through our bandsaw-testing procedures. Both of these Taiwanese-made saws performed well enough to put them in contention with the Delta units. Here's a look at each of the machines.

At $550 plus shipping, Grizzly's new model G1073 has more-power (1½ hp), more throat capacity (16"), and more heft (395 pounds shipping weight)

*Continued*



Print this article

than any saw in its price range. In our tests the machine ran smoothly with little vibration. We attribute the lack of vibration to the machine's well-balanced, cast-iron wheels and its immense weight. The one-piece, heavily webbed, cast-iron body showed absolutely no flexing in our tests.

This heavy-duty construction continues in the guides and guide posts. A 1"-wide, square steel post fits inside a cast-iron housing with adjustments for setting the post parallel to the blade throughout its travel. The guides have micro-adjustments and thrust bearings.

Niceties on this saw include hinged wheel covers that open and close easily and don't vibrate, a dust brush for keeping the bottom wheel clean, and a well-placed 2½" dust port. Also, the bandsaw comes with a fence that locks securely and accurately—an expensive option on most bandsaws.

With the model WBS-14, Jet has produced a saw that looks nearly identical to the Delta bandsaw. Except for the shape of some knobs, and the lack of micro-adjustment on the lower guides of the Jet, we could not find any significant differences between the machines.

Although overall fit and finish on the Jet machine was good, the Delta's is slightly better. The Jet required more time and effort on our part to get blades to track in the center of its wheels. To its advantage, Jet's entry comes with a 1-hp motor and enclosed stand. It sells for $500–$550. That's about $50–$100 less than the Delta 28-245 and $200–$250 less than the Delta 28-283 (Delta makes both machines in the U.S.). Optional Jet accessories, such as the riser block, fence, and miter gauge, also cost less than similar Delta components.

**A bevy of new blades from four manufacturers (clockwise from lower left): Black & Decker Piranha Pro, Freud, CMT, and Integra. Both the Freud and CMT blades have sound-dampening channels laser-cut into their bodies.**

| MANUFACTURER | MODEL | NUMBER OF TEETH | KERF (INCHES) | |
|---|---|---|---|---|
| BLACK & DECKER | 73-579 | 60 | .104 | |
| CMT | 110-240 | 24 | .125 | |
| | 110-500 | 50 | .127 | |
| | 110-800 | 80 | .125 | |
| | 110-801 | 80 | .110 | |
| FREUD | F410 | 40 | .108 | |
| | F810 | 80 | .125 | |
| INTEGRA | IP4000 | 40 | .119 | |

**NOTES:**

1. (ATB) Alternate top bevel
   (ATB/R) Alternate top bevel with rakers
   (FT) Flat top
2. Hook angles are positive except for those with minus (-) symbol which are negative.
3. Bevel angles for ATB/R blades are for the beveled teeth. Raker teeth have flat (0°) tops.
4. (NR) Blade not recommended or intended for this operation.

E Excellent
G Good
F Fair

# A batch of new blades

Since our last report on 10" circular blades, a lot has happened in the marketplace. Black & Decker has come out with Piranha Pro blades, CMT has completely revamped its line, changing from a Canadian to an Italian manufacturer, Freud has debuted two new blades with high-bevel teeth, and a new player, Integra, has brought out a blade to challenge the Forrest 40-tooth Woodworker II. After running these blades through the same tests we conducted for our original report, we tabulated the results in the chart *below*.

At the conclusion of the testing, we were impressed by the improvement in the CMT line. All of its blades performed well, including a 60-tooth radial-arm saw blade that we did not include in the chart because we did not test radial-arm saw blades in the original test.

Both of the Freud blades performed well, and the F410 blade earns our nod as the best value among today's all-purpose blades. The F810 does not leave the glass-smooth edges that we earlier experienced with another Freud 80-tooth blade, the LU85. However, the F810 excels when used to cut plywoods and melamine-coated particleboards because it does not chip the fragile top and bottom surfaces. Like the CMT 110-800 and 110-801 blades, the F810 has a high top-of-tooth bevel angle. This severe angle helps the teeth cleanly shear delicate materials. But, keep in mind that these teeth dull more quickly than teeth with low bevel angles.

The Integra IP4000 blade comes close to matching the performance of the Forrest 40-tooth Woodworker II, the top-ranked blade in our last test. The IP4000 produces the same smooth edges as the Forrest blade does, but it tends to chip plywood edges slightly more than the Forrest product. At nearly half the cost of the Woodworker II, it's easy to overlook the minor shortcomings of the Integra blade.

Written by Bill Krier  Technical consultant: Bob McFarlin  Photographs: Hopkins Associates

## FOLLOW-UP EVALUATION OF 8 PREMIUM SAW BLADES

| | | | | | QUALITY OF TABLESAW CUTS (4) | | | | | | | | | | QUALITY OF MITERSAW CUTS IN 3/4" SOLID OAK (4) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SOLID STOCK (3/4" OAK) | | | | | PLYWOOD (3/4" OAK VENEER) | | 1 1/2" SOLID BIRCH | | | | | | | | | |
| | | | | | RIPPING | | CROSSCUTTING | | | | CROSSCUTTING | | RIPPING | | | | | | | | |
| | TOOTH GRIND (1) | TOOTH HOOK ANGLE (DEGREES) (2) | TOP OF TOOTH BEVEL ANGLE (DEGREES) (3) | PLATE (L) LASER-CUT (S) STAMPED | JOINT QUALITY OF EDGE (5) | SMOOTHNESS OF EDGE (6) | CHIPPING ON TOP OF CUT (7) | CHIPPING ON BOTTOM OF CUT (7) | SMOOTHNESS OF EDGE (6) | JOINT QUALITY OF RIPPED EDGE (5) | CHIPPING ON TOP OF CUT (7) | CHIPPING ON BOTTOM OF CUT (7) | JOINT QUALITY OF EDGE (5) | SMOOTHNESS OF EDGE (6) | CHIPPING ON TOP OF CUT (7) | CHIPPING ON BOTTOM OF CUT (7) | NOISE LEVEL-NO CUTTING LOAD (8) | NOISE LEVEL-WITH CUTTING LOAD (8) | COUNTRY OF ORIGIN (9) | LIST PRICE | SELLING PRICE |
| | ATB | 20 | 10 | S | E | G | G | E | G | G | F | E | NR | NR | G | F | 84 | 86 | U | $ 83 | $ 62 |
| | FT | 20 | 0 | L | E | G | NR | NR | NR | NR | NR | NR | E | G | NR | NR | 83 | 86 | I | -- | 41 |
| | ATB/R | 12 | 15 | L | E | G | G | E | G | E | G | G | E | G | G | F | 86 | 87 | I | -- | 53 |
| | ATB | 5 | 40 | L | NR | NR | E | E | G | E | E | E | NR | NR | E | E | 80 | 83 | I | -- | 58 |
| | ATB/R | -5 | 30 | L | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | E | E | 80 | 83 | I | -- | 58 |
| | ATB | 13 | 18 | L | E | G | E | E | G | E | E | E | E | G | E | G | 82 | 84 | I | 95 | 50 |
| | ATB | 2 | 38 | L | NR | NR | E | E | G | E | E | E | NR | NR | E | E | 80 | 83 | I | 135 | 75 |
| | ATB | 15 | 15 | L | E | E | E | E | E | E | G | G | E | E | E | G | 83 | 88 | U | -- | 70 |

5. Amount of visible line at joint of two edge-joined boards.
   - E: Barely noticeable lines on top and bottom of joint.
   - G: Barely noticeable line on top of joint; minor line visible on bottom of joint.

6. Degree of scratching (blade marks) on edge of stock.
   - E: No visible scratches.
   - G: Fine scratches that remove with hand-sanding.

7.
   - E: Minor chipping; edge is suitable for edge-joining or edge-banding.
   - G: Moderate chipping; edge is suitable for most applications.
   - F: Chipped edge that requires repair.

   Note: Results in plywood vary greatly according to quality of plywood being used. Test results based on high-quality, plain-sliced, oak-veneer plywood.

8. Measured in decibels from a distance of 3'.

9. (I) Italy
   (U) United States

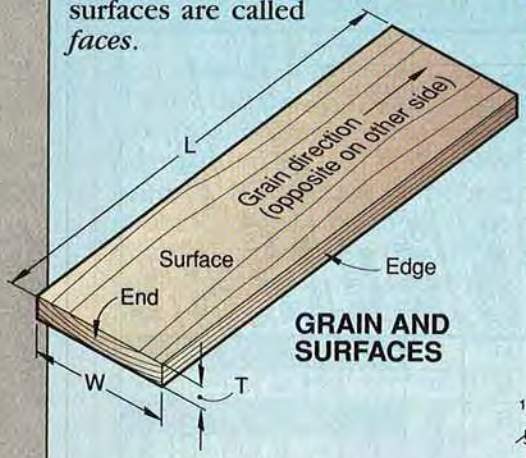
# BOARD

## What woodworkers need to know

**When is a groove a dado? What's the difference between ripping and resawing? And why would anyone give dimensions as ½×4×2" when it sounds so much more correct to say ½×2×4"? The answers to these and other woodworking questions depend on one thing—which way the grain runs.**

### Let the grain guide you

When you start talking about grain, you have to think about the log the stock comes from. The concentric growth rings visible on the ends of the log form those stripes—often arc-shaped—that you see on the ends of a board. This distinctive *end grain* provides a convenient reference point for identifying the six planes on a board, shown *below*. When thickness equals width, all four surfaces are called *faces*.




GRAIN AND SURFACES

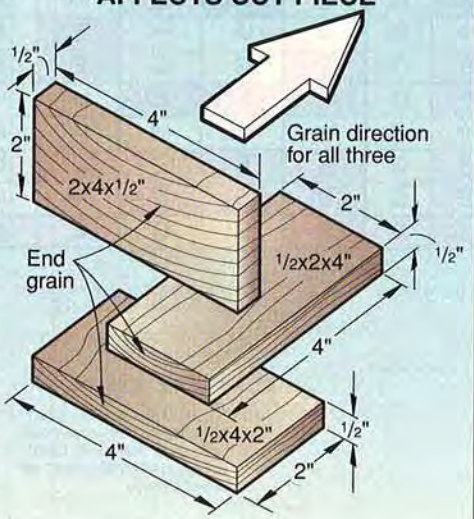
As simple as *edge*, *surface*, and *end* seem, confusion arises because these planes on the stock may not correspond to directional terms for the part. For instance, on a box with the grain running horizontally, references to the front and back edges of an end piece will indicate the ends of your stock. So, be sure you're clear whether directionals and terms such as edge or end refer to the stock or the project part.

### Keep dimensions in order

Measurements can lead to confusion, too. Wood dimensions are customarily given in a specific order—thickness, width, and length (T×W×L). Thickness is normally the smallest dimension on the end of the board; width, the measurement *across* the grain; and length, the measurement *along* or *with* the grain, as shown in the drawing *left*.

If you swap given dimensions when you cut a piece for a project, the part will fit, but it might not look right. Rearranging dimensions also could affect the strength or durability of a project. The illustration *below* shows three ways a piece could be cut simply by changing the order of the dimensions.

HOW DIMENSION ORDER AFFECTS CUT PIECE



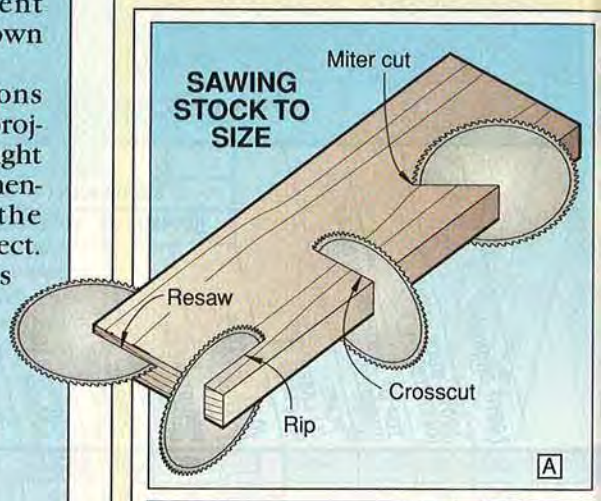

### A glossary of cuts

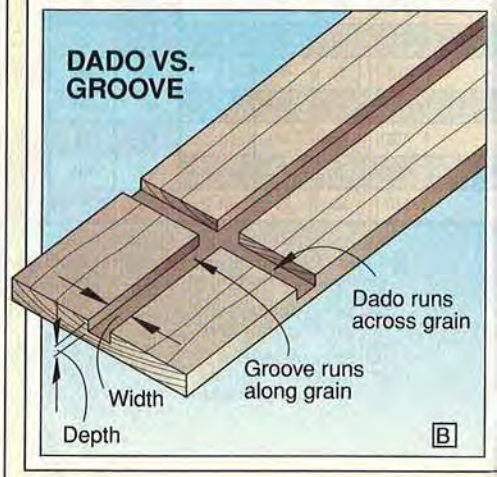
To cut stock to size, woodworkers rely on three basic sawing operations, all defined in relation to grain direction. The sizing cuts, shown in drawing A, are:

**Crosscutting:** Sawing across the grain to reduce a board's length. (Also called *trimming*.) A crosscut at an angle other than 90° to the board's edge is a *miter cut*.

**Ripping:** Sawing in the grain direction to reduce a board's width. A surface or face will rest on the saw table.

**Resawing:** Sawing in the grain direction to reduce thickness. An edge of the piece being resawn will rest on the saw table.





Print this article

# BASICS They're easy to learn if you follow the grain

Here are some other terms you'll run across:

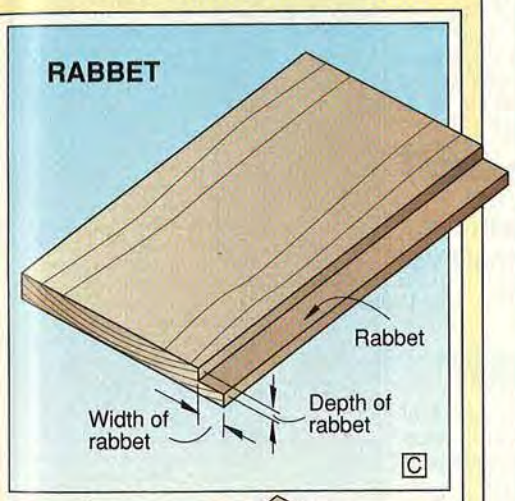
**Dado:** A flat-bottomed channel that runs across the grain, open from edge to edge, as shown in drawing B.

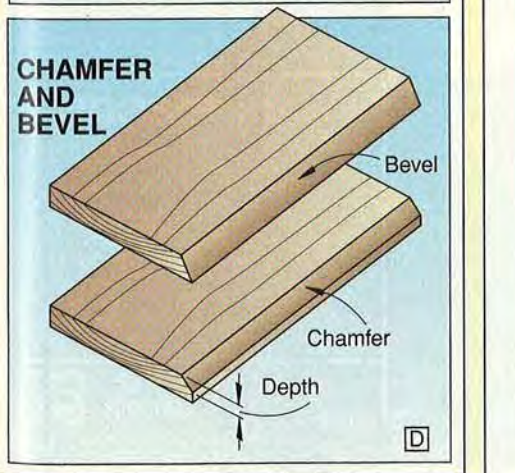
**Groove:** A similar channel running with the grain. Stock with a groove in it is sometimes called *plowed* or *ploughed* stock.

**Rabbet:** A channel along an edge or end of a piece of stock, shown in drawing C.

**Bevel:** An angled cut across an entire edge, end, or face, shown in drawing D.

**Chamfer:** An angle cut on a portion of an edge, end, or face.



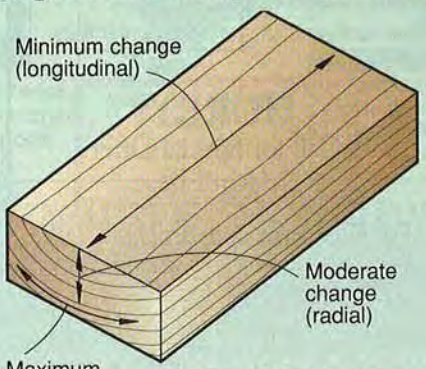




## Warps and size changes

As humidity changes, so does the size of a piece of wood. Exposed to high humidity, wood swells, only to shrink when the humidity decreases. This movement, which varies in degree among species, also relates to grain.

Only the slightest dimensional change occurs with the grain, or lengthwise. But thickness and width can vary considerably. Going from green to oven-dry (a testing standard, not to be confused with kiln dry), some woods shrink by almost 13 percent in width, or more than ¾" on 6"-wide stock. Since you'll ordinarily build projects from dried stock, you won't experience such extreme variations. Also, wood once dried doesn't expand to that degree when exposed to normal humidity changes.

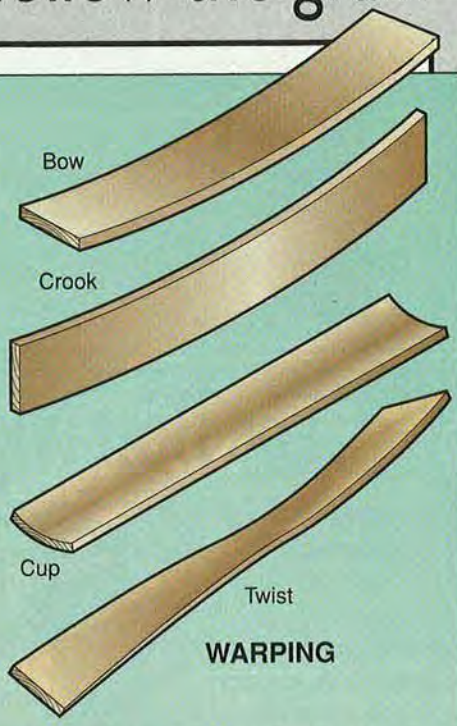
A look at the end grain will give you some clues as to how a piece of wood will react to humidity. Movement will be greatest in the direction of the stripes or arcs, or *tangential* to them, shown *below*.




**WOOD EXPANSION AND CONTRACTION**

*Radial* growth and shrinkage—across the arcs—will be less, probably in the range of 40-80 percent of the tangential value, depending on the species.

This uneven shrinkage can set up stresses in a piece of wood, causing it to warp. Here and shown *above* are four common warps you'll encounter:




**WARPING**

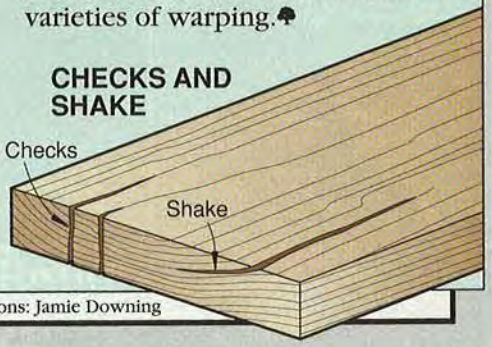
**Bow:** A curve from end to end, resulting in a board that rocks from end to end on one face.

**Crook:** An edge curvature from end to end, resulting in a board that rocks on one edge.

**Cup:** Edge-to-edge curvature, resulting in a board that rocks from side to side on one face.

**Twist:** A warp that lifts one corner, resulting in a board with ends that aren't parallel.

*Checks* (cracks across growth rings) and *shakes* (cracks between growth rings), shown *below*, often accompany warping, too. And, of course, if things are going really badly, you could find a board that combines two or more varieties of warping.

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Circle No. 2010

*Continued from page 76*

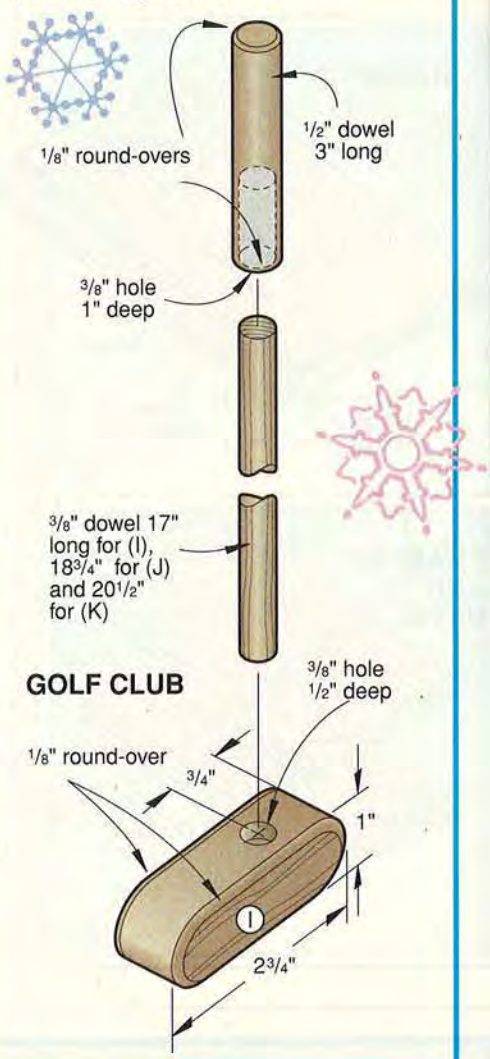
## Now, let's build the putter, wood, and iron

**1** Cut the putter head (I), iron (J), and wood (K) to the sizes listed in the Bill of Materials.

**2** Transfer the shape and hole centerpoints to the pieces just cut from the *WOOD PATTERNS*™ insert. Drill the holes, and then cut the club heads to shape.

**3** From ⅜" dowel stock, cut the club shafts to the lengths listed on the Golf Club drawing *below*.

**4** Cut 3"-long club grips from ½" dowel stock. Drill a ⅜" hole 1" deep in one end of each grip. Glue the three pieces together to form each golf club.



# ASK WOOD®

**Whether your woodworker's license reads "Beginner," "Intermediate," or "Advanced," you're bound to have a few questions about your favorite hobby. We can help by consulting our staff and outside experts. Send your questions to Ask *WOOD*®, *Better Homes and Gardens*® *WOOD* Magazine, 1912 Grand Ave., Des Moines, IA 50309-3379.**

## How to determine correct pulley size

*A friend gave me an old Delta 4" jointer. It was mounted on a homemade table with an inoperative washing-machine motor. I have a replacement motor with a speed of 1725 rpm. What size pulleys will I need to use on the motor and the jointer?*

***—Charles Condrotte, Petaluma, Calif.***

The size of the pulleys depends on the desired cutterhead speed. From specifications in manufacturers' catalogs, we determined that many 4" jointers on the market today have cutterhead speeds ranging from 4000 to 5000 rpm. We have seen jointers listed with faster speeds, but we cannot recommend running a jointer cutterhead faster than 5000 rpm without first checking the manufacturer's recommendations.

Try this procedure for determining the pulleys you need for this speed range (our example uses a desired-cutterhead speed of 4250 rpm):

1) Select a pulley size for the fastest-moving part (in this case the cutterhead). Start with a pulley the same diameter as the cutterhead (probably 2" in diameter for most small jointers).

2) To determine the motor-pulley size, first multiply the cutterhead-pulley size by the desired speed:

(2 × 4250 = 8500)

3) Then, divide this figure by the motor speed:

(8500 ÷ 1725 = 4.9)

4) Round off the number to the nearest pulley size available (in this example, 5"). Most hardware stores stock pulleys in diameters ranging from 1½" to 6" to fit ½- and ⅝"-diameter shafts.

## Help with finding the center of a half-lap

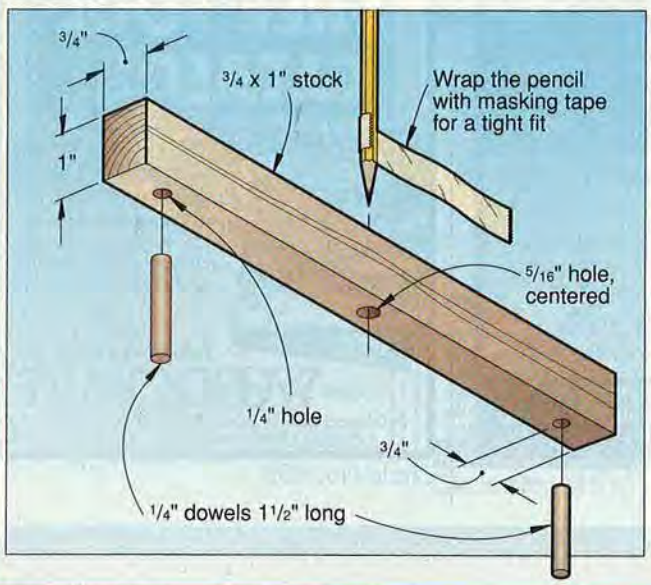
*I have difficulty in determining the halfway point on the edge of a workpiece when cutting half-lap joints. When I try to cut these joints, I find myself readjusting my saw until my patience wears out. How can I make this process easier?*

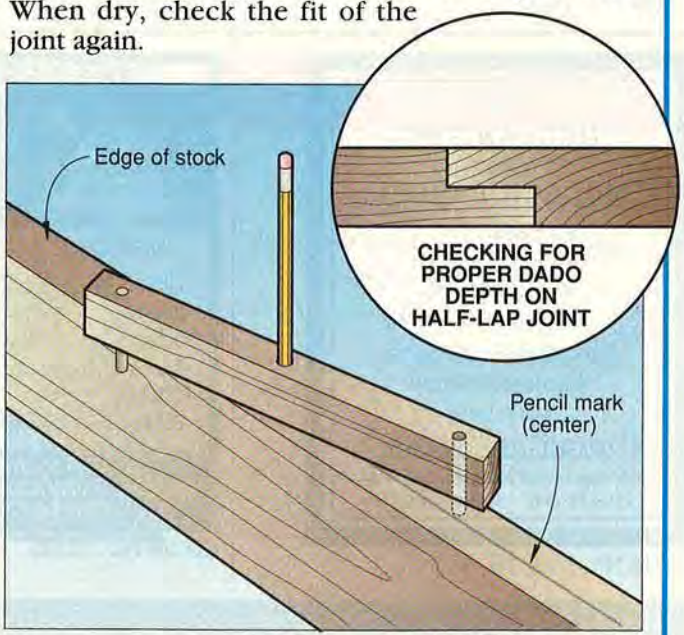
***—Cal Withers, London, Ont.***

Cal, use the jig shown in the drawing *below*. To find the exact center of a board's edge, place the jig on the board, with the end dowels touching opposite sides of the board and the pencil in contact with the edge. Pull the jig along the board to mark a centerline on the edge.

Next, follow this procedure to set the correct depth of cut for your dado blade. First, use the jig to mark the centerline on two pieces of scrapwood that match the thickness of your project wood. Then, adjust the dado blade so the cut just touches the pencil mark. Make a test cut on this scrapwood, and place the cut faces together as shown (*inset below*). Adjust the sawblade height as necessary, and repeat the cuts until the outside faces of the scrapwood are flush when the dado faces are held together.

Cut the dadoes for the half-lap joint, and check the fit. If needed, re-machine the joint to bring the board faces flush. Or, where the dado is too deep, glue and clamp a piece of veneer to one joint face. When dry, check the fit of the joint again.

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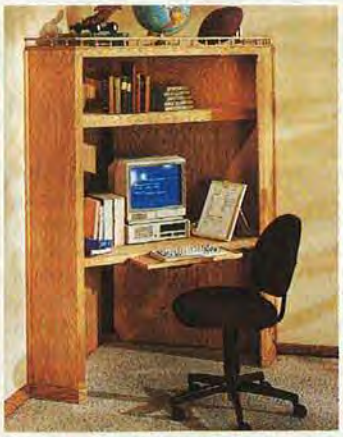

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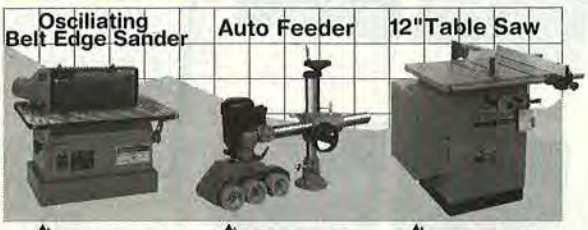


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# ASK WOOD

*Continued from page 92*

## Stacked and stickered is best

*I recently acquired about 2,500 board feet of rough-sawn hardwood, including walnut, maple, oak, and cherry. It is 10 years old, dry, stable, and eight to ten feet in length. The stock is stacked and stickered, but this makes selection and removal difficult. Can I store the boards vertically without damaging them?*

***—Walter C. Koebler, Dallas***

Sorry, Walt, but storing wood in a vertical position can result in the lumber developing a curve or bow toward the bottom side of the board. The ends of the boards are supported by the wall and the floor, but the middle of the board has no support and reacts to gravity.

We recommend that you continue to stack and sticker this lumber. Build a 2-3' wide stack of each species. This still will require dealing with the stickers each time you need lumber, but your wood will remain stable and straight over time.

## Rays and rift-sawing

*I am working with some oak that has light-colored irregularities running across the grain. Sometimes the larger areas of these irregularities will tear out when being planed or jointed. Can you identify these spots for me, and how can I prevent tear-out?*

***—Bruce Couture, Metamora, Mich.***

Yes we can, Bruce. These irregularities are vascular rays, areas of soft tissue or parenchyma cells that extend radially from the center of the tree out toward the bark. (See photo *right*). These rays are most pronounced in oak species when the boards are rift-sawn, or cut at an angle to the radial plane. A lot of craftsman-style furniture and woodwork in early 20th-century houses was made using rift-sawn oak, taking advantage of the patterns caused by exposing these rays.

For best results when planing wood displaying these soft rays, follow these precautions:

1) Use only sharp jointer and planer knives.

2) Move the wood slowly across the jointer, and if possible, reduce the rate of feed of your planer while thicknessing the wood.

3) With both your jointer and planer, take light cuts with multiple passes.

*Continued on page 96*

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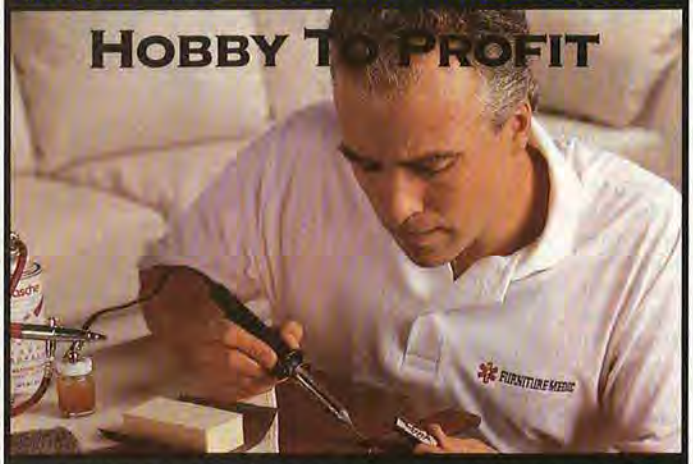

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# ASK WOOD

*Continued from page 94*

## The hunt for Taiwanese tool parts

*I'm rebuilding the head on my drill press, made by Sun Machine Tools of Taiwan. Where can I get the needed parts?*

***—Robert Jensen, Mountain Home, Idaho***

We have received many requests from readers looking for parts for Taiwanese machinery, Bob. The truth, however, is that most of these odd-brand machines have no parts or service network in place for repairing them. In addition, we know of no listing of interchangeable parts between the Taiwanese machines and North American machines. Finding these parts involves a combination of effort and good luck.

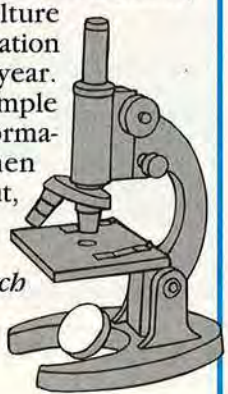
Because many of these machines are copies of equipment from North American manufacturers, some of the parts from Delta and other brands may fit your imports. Also, look for replacement bearings at machinery-supply companies. We suggest you take the broken or worn pieces to a tool dealer or machinery supplier, and ask to compare these pieces with parts they stock. If lucky, you may find a part that will work. Otherwise, you may have to cannibalize parts from a similar Taiwanese machine (if you can find one). Regardless of where you locate the missing parts, keep in mind that WOOD® magazine does not stand responsible for the failure of, or injury caused by the use of, cannibalized parts in repairing equipment.

## Mystery wood identification

*I found a supply of an unknown lumber species at a small mill, and would like to use it in a project. The owner and I could not agree on a price because we do not know the value of the wood. If we sent a small piece of wood to your offices, would it be possible for you to determine what this wood might be?*

***—Jeffrey S. Boucher, St. Joseph, Mich.***

We do not have a wood technologist on our staff at WOOD magazine, Jeff, so our identification would be at best a guess. The Forest Products Laboratory of the U.S. Department of Agriculture does provide a free wood-identification service, for up to five samples a year. Send a 1 × 3 × 6" nonreturnable sample of the wood, along with any information you know about the specimen (for example, where and when cut, or purchased) to:



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# FINISHING TOUCHES

## HOLLYWOOD HOT-ROD PIONEER SHIFTS GEARS TO WOODWORKING

Print this article

You won't find woodworker Norm Grabowski's name listed among Oscar-award winners of the silver screen. And his home isn't on the Hollywood stars' tour route. Nevertheless, the former California hot-rodder and film industry stunt man/actor still claims some significant credits.

In the 1950s, Norm introduced the street rod to a car-crazy generation when his flashily painted, V-8 powered, T-bucket roadster appeared as the "Kookie Car" on the popular television series "77 Sunset Strip." Then, Norm got the acting bug and appeared in several movies, including "Darby's Rangers" and "Son of Flubber." Meanwhile, his custom hot rods appeared in *Hot Rod* magazine and other publications.

Today, a lot of things have changed, but not Norm's zeal to create the unusual. "I got tired of the freeways and all that," Norm says of his decision to move to Lead Hill, Arkansas, six years ago. Of course, Norm returns to California occasionally. But these days the trips are to deliver his new custom work—handcrafted rocking horses made of oak and figured walnut. His horses even include brass and silver trim, as shown *above right.*

**Norm Grabowski's custom-crafted rocking horses boast the same detailing that made his 1950s hot rods a hit.**

"I get a kick out of seeing my old friends, and selling my horses. The first one I made was for my niece," Norm explains. "I had done some woodworking on custom cars, but the rocking horses were my wife's idea. Now, they grace the sales rooms of many Southern California custom-car shops where I used to hang out."

## THE FIRST "CHRISTMAS" TREE WAS AN OAK

In 2nd-century Ireland and Wales, the Celtic druids commemorated the winter solstice—the year's shortest day—by festooning oak trees with apples. By the late Middle Ages, Europeans had shifted the pagan emphasis to a more Christian one, and swapped the oak tree for an evergreen.

During the 16th century, the first retail sale of Christmas trees occurred in Strausberg, Germany, when trees from the nearby forests were sold in the marketplace. However, we owe the origin of the convenient Christmas tree lot to American Mark Carr. In the early winter of 1851, he brought two tree-laden sleds from the Catskill Mountains to New York City and sold the conifers on the streets.

## It answers all of your treated-wood questions

Can you use treated wood as garden stakes? What about burning it in the fireplace? For answers to these questions and more, go straight to the horse's mouth.

*Answers to Often-Asked Questions about Treated Wood,* a publication with all the information you'll ever need to know about treated wood, is available free from: American Wood Preservers Institute, 1945 Old Gallows Rd., Suite 550, Vienna, VA 22182.

## RAIN FORESTS FOREVER?

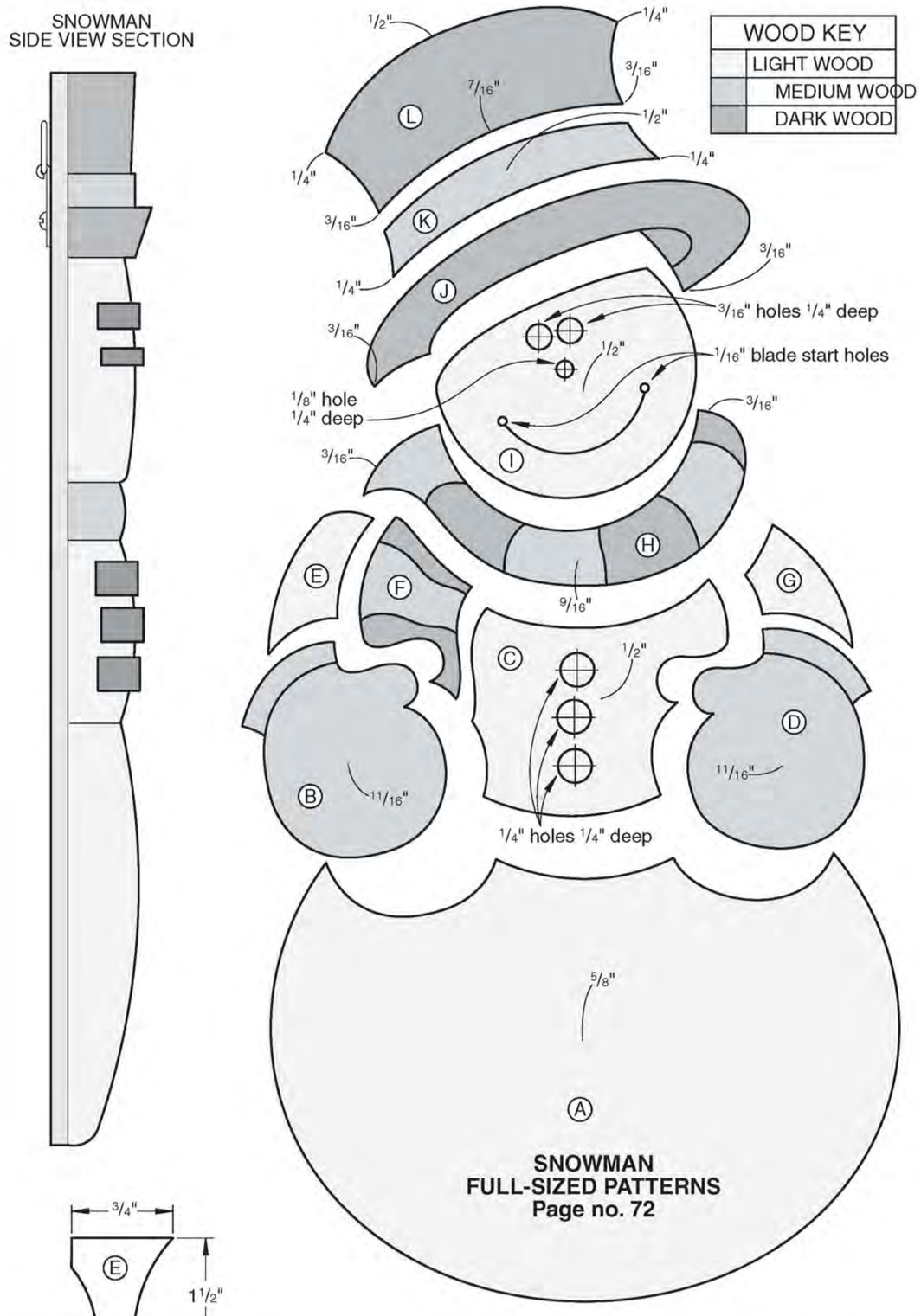
Indonesia, a Southeast Asian country with a land area of 788,430 square miles (three times the size of Texas), has 10 percent of the world's tropical rain forests. These 350 million forest acres contain an estimated 4,000 tree species, of which about 50 are harvested and made into hardwood and softwood plywood by Indonesia's forest products industry. For instance, Indonesian plywood, made from a species named meranti, is widely available in the U.S.

In the lush, rain-forest habitat, the growth rate of some trees exceeds 10' a year, and harvested areas quickly regenerate. That doesn't mean, though, that whole forests are destroyed and left to hopefully grow again. The Indonesian government has permanently set aside 75 million acres of rain forest as areas closed to all commercial and public use. Another 47 million acres are protected as conservation areas, but open to the public.

**Lush Indonesian rain forests are home to thousands of animal species.**

The government allows timber harvesting in the remaining rain forest, but carefully regulates it. In fact, loggers may only fell two or three trees per acre. Then, harvesting isn't permitted for 35 years! Loggers also pay a fee based on timber volume that funds reforestation. In this way, the people of Indonesia feel that their share of the world's rain forest will last forever.

Photographs: Courtesy Norm Grabowski; Wilson/Donaldson Assoc. Illustration: Jim Stevenson



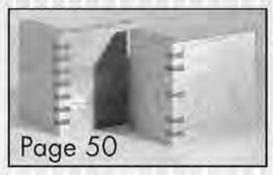

Better Homes and Gardens®

# WOOD® PATTERNS™

**Full-sized for your woodworking convenience**

**DECEMBER 1994** **ISSUE 75**

Dear Reader: As a service to you, we've included full-sized patterns on this insert for irregular-shaped and intricate project parts. You can machine all other project parts using the Bill of Materials and the drawings accompanying the project you're building.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- **Decorative joint reinforcements**
- **Turned snowballs**
- **Shop clock**
- **Chip-carved ornaments**
- **Intarsia snowman**
- **Kid's golf cart & clubs**

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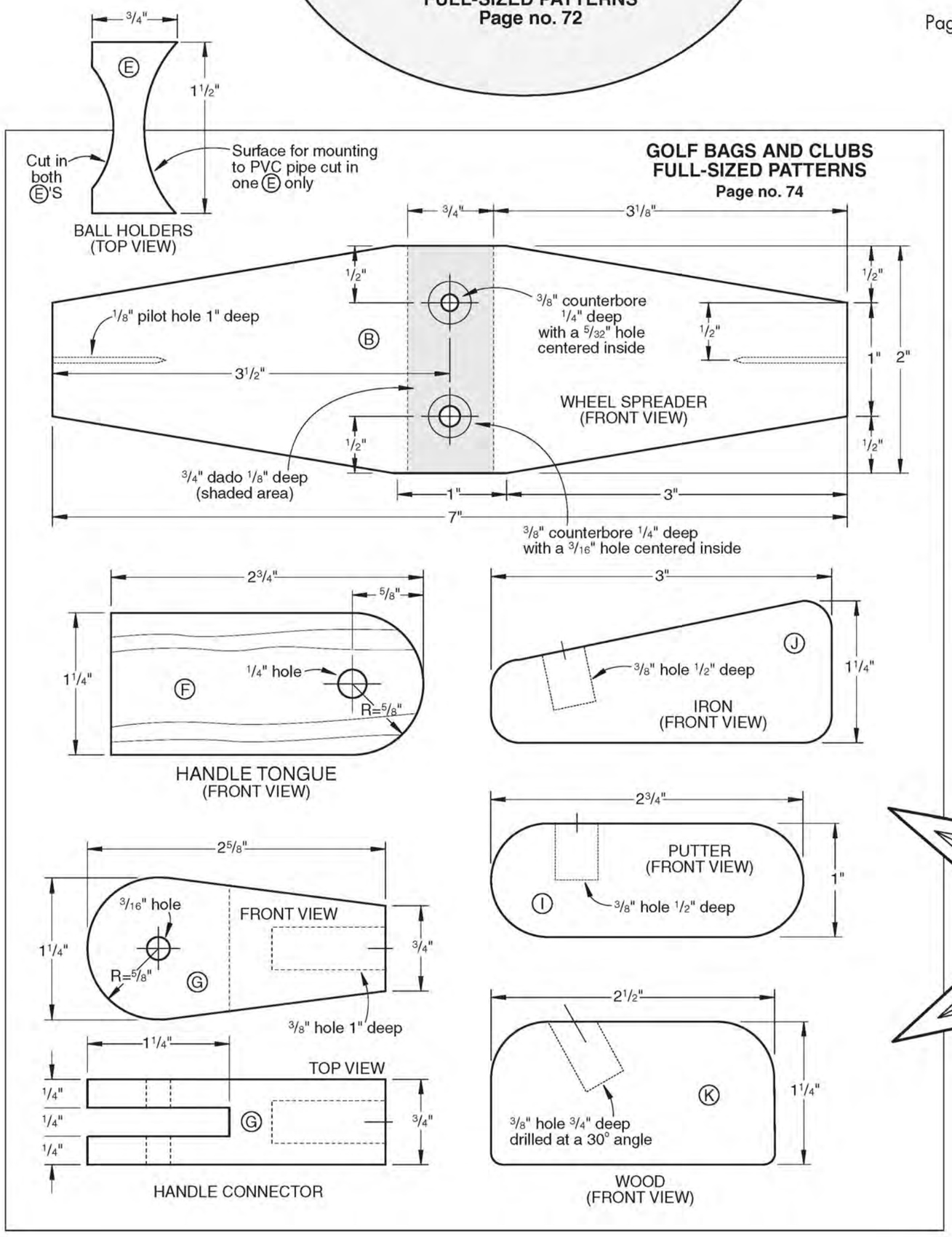


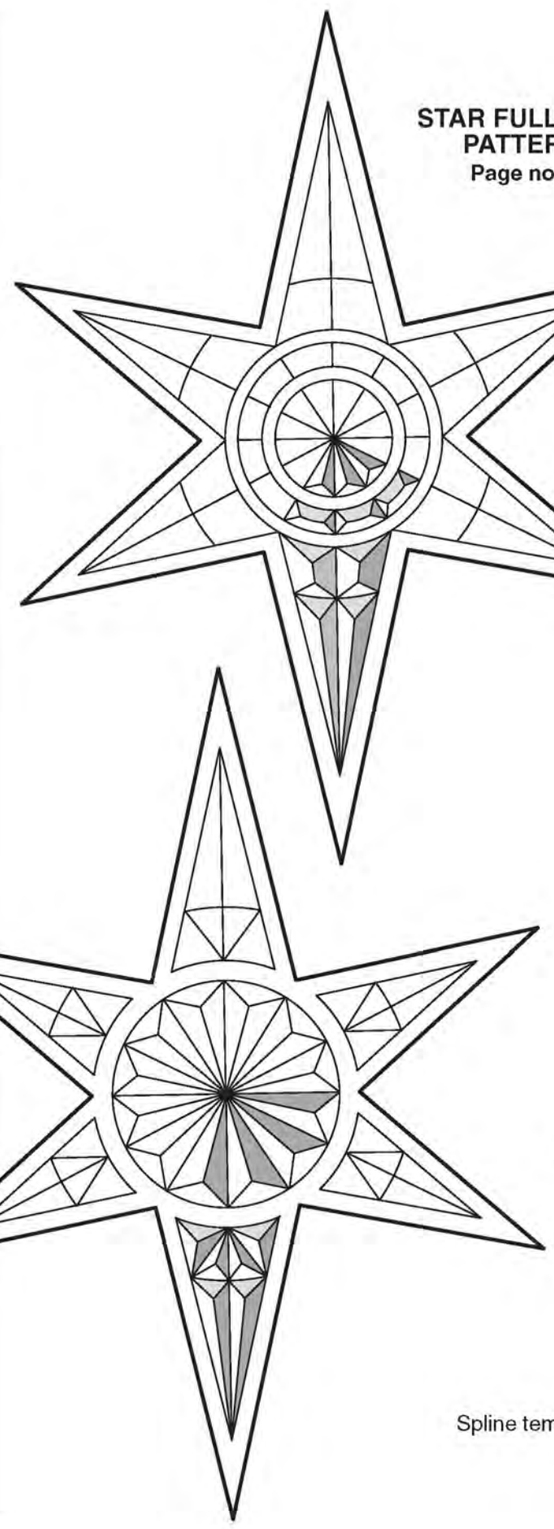


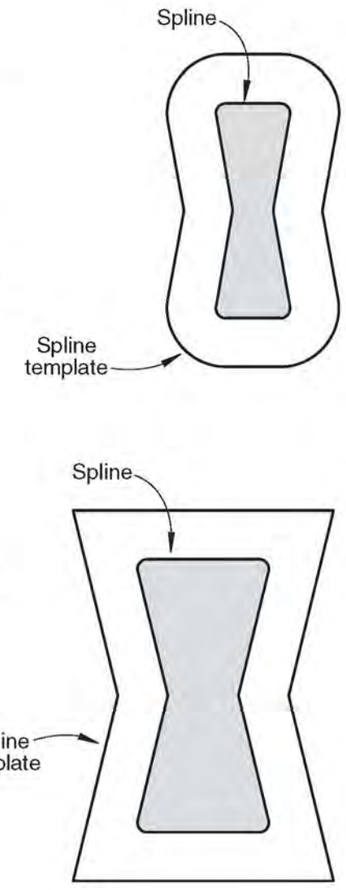




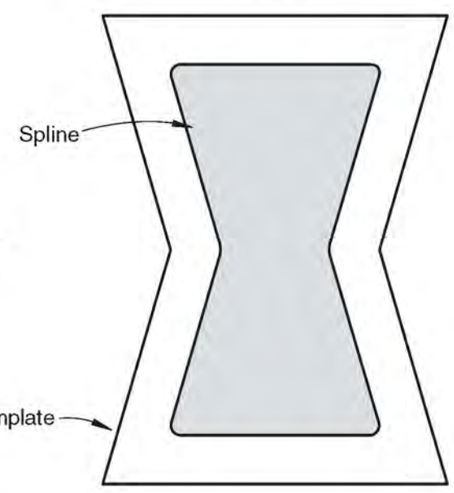

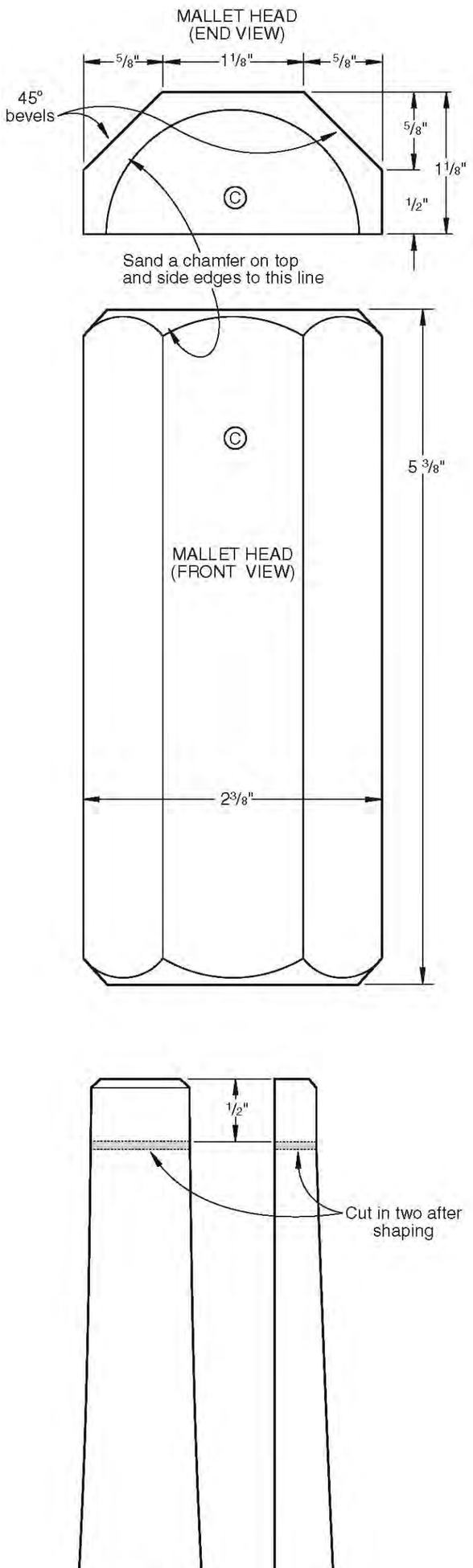


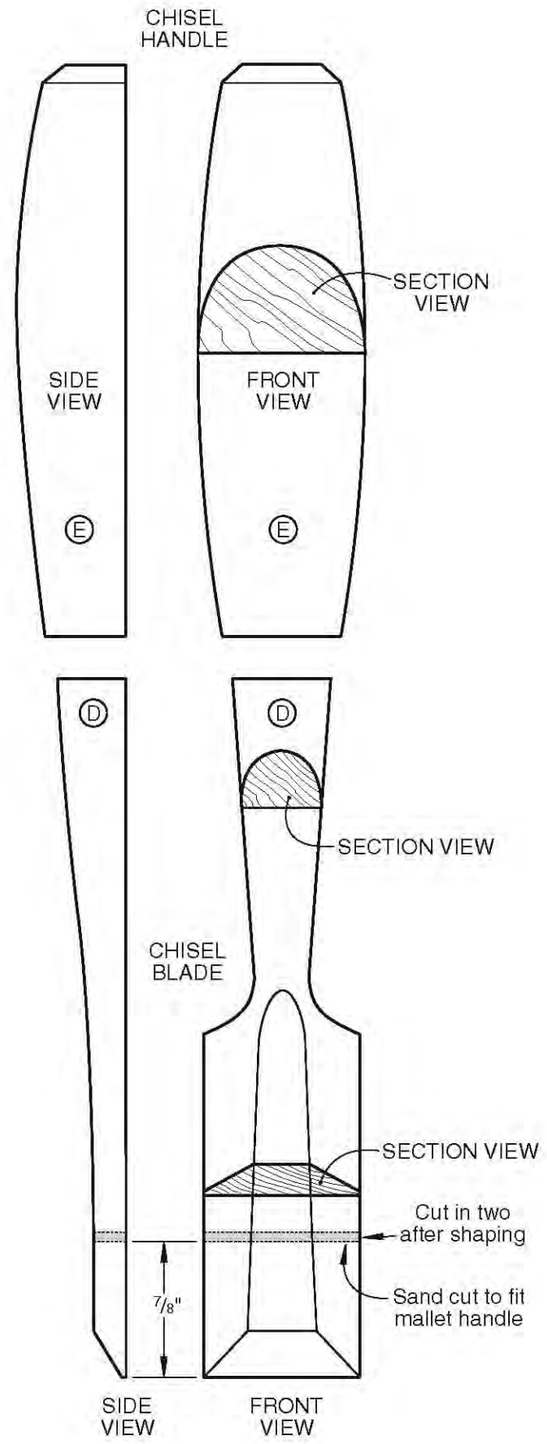


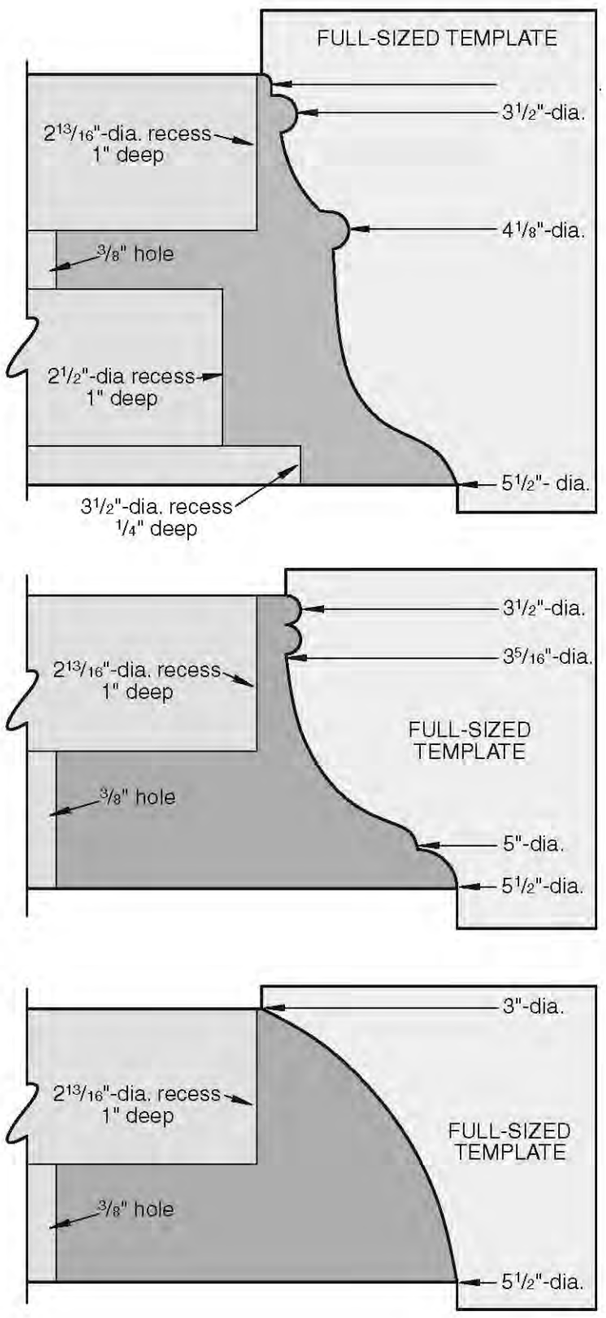


**MUSIC BOX BASES**
**FULL-SIZED PATTERNS**
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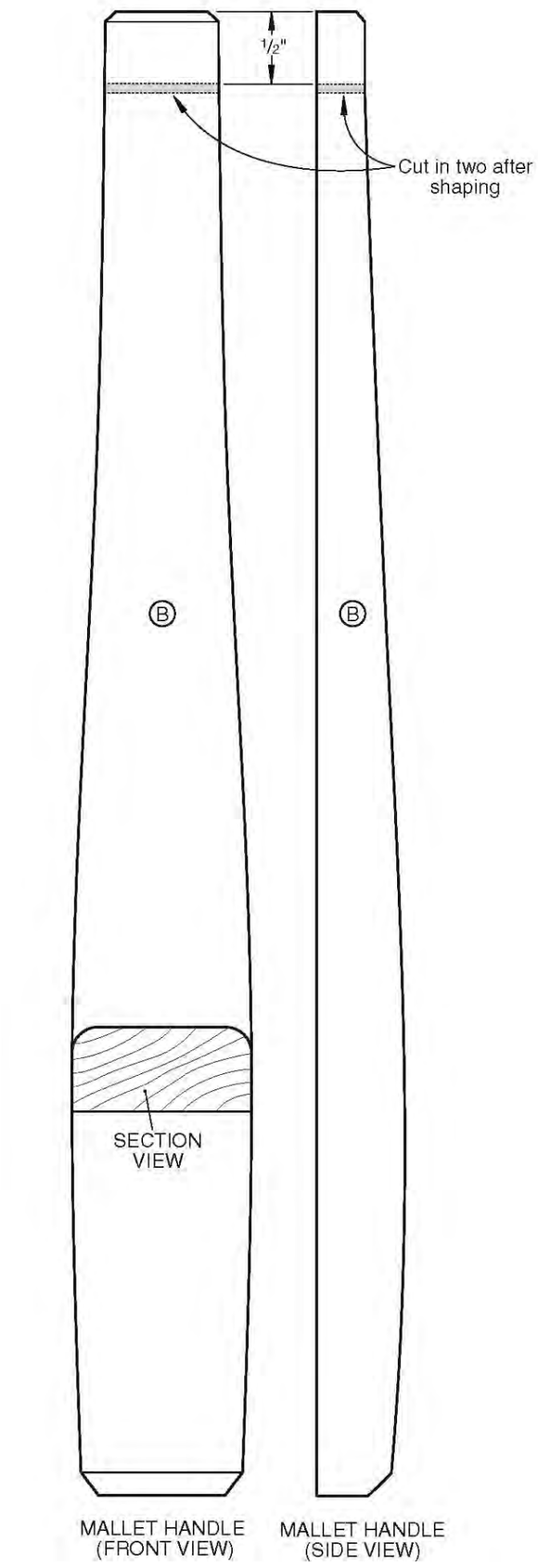


**SHOP CLOCK**
**FULL-SIZED PATTERNS**
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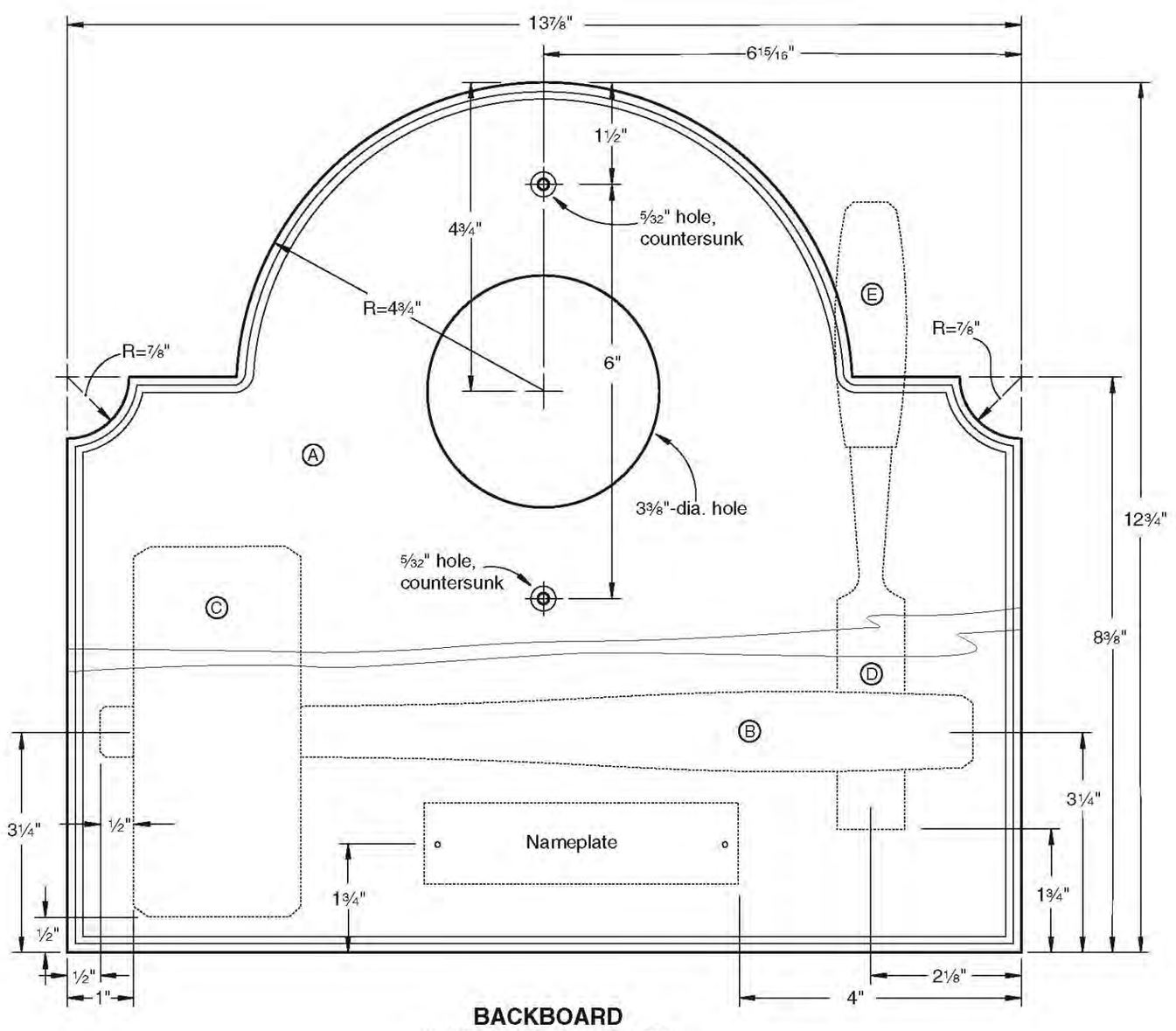


**BACKBOARD**
**(FRONT VIEW SCALED**
**AT 50%)**